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Cleaner Production

Fourth High Level Seminar in Oxford

- Fourth High Level Seminar Report
- National Cleaner Production Centres
- Instruments to promote cleaner production
- Regional initiatives

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Editorials

Elizabeth Dowdeswell,
United Nations Under Secretary General and Executive Director, UNEP

When we met in the thought-inducing environs of Oxford, one idea was paramount in my mind: we must be prepared to challenge the legitimacy of our social, economic and political institutions wherever they militate against life on earth. Building sustainable development is a task of immense complexity. There is a growing consensus that a change in production and consumption patterns is necessary, and that an increase in productivity in the use of energy and raw materials by a factor of 5 to 10 is imperative if the goal of sustainable development is to be achieved. This presents an enormous challenge to us all.

The Fourth High Level Advisory Seminar builds on the conclusions of the previous Cleaner Production Seminars, held at Canterbury, Paris and Warsaw. Since we last met in Warsaw in 1994, much has happened. UNEP has developed a productive partnership with the World Bank and China's NEPA, where real progress in implementing cleaner production has been achieved. The ongoing partnership with UNIDO has resulted in an expanding worldwide network of National Cleaner Production Centres. The task of information dissemination has been well served by the development of cleaner production diskettes and a Worldwide Web homepage, and UNEP has worked closely with Dutch institutions to produce a primer on Life Cycle Assessment. Many other "good news" stories could be told.

So, much has been achieved. But we cannot afford to be complacent. In spite of all of our good work, we have still not reached critical mass. We are still leading only a minor uprising rather than a major revolution, and developments continue elsewhere.

One of the most significant parallel developments has been the progress of ISO 14000 to a fully fledged international standard on environmental management systems. This raises an interesting question. How does this standard relate to cleaner production and vice versa? The answer, I think, is that environmental management tools will have to be used to achieve cleaner production. The standard encourages the concept of continuous improvement, but implementation of a management system is no guarantee that goods and services produced will be more environmentally benign. Our task is to ensure that the standard is interpreted as the need to make the transition from end-of-pipe compliance to preventive, precautionary and proactive approaches, in other words to cleaner production.

Our purpose for the future should not be to simply spread the cleaner production message. There is a pressing need for us to move beyond defining cleaner production and merely acknowledging it as a good idea. Our challenge is to enlarge the frontiers of cleaner production; to seek out innovative approaches in new and untried sectors; to identify innovative new financing mechanisms; and to explore new methods of building and enhancing capacity. We need to share our success stories, to discover new ways to tear down persistent barriers.

Our discussions must also go beyond just the technical aspects. No matter how many successes we have in cleaner production, they will amount to nothing if we fail to address fundamental issues of consumption and to promote sustainable consumption patterns. The challenge of environmental problems and sustainable development require sound science, good public policy and social consensus. All three of the elements of the formula will require our continued thoughtful consideration, creativity and persistence if we are to progress on the road to sustainable development. ◆

James Clappison MP
Parliamentary Under Secretary of State for the Environment, United Kingdom

The UK had the privilege of hosting the first in this series of UNEP Cleaner Production seminars, at Canterbury in 1990. When UNEP established the Cleaner Production Programme in 1989, the UK was quick to respond. The UK Department of the Environment had then recently embarked on its own programme to help promote innovation in environmental technology.

Many of you deal at first hand with the pressures confronting developing countries as they work for essential economic growth. Industrialization is essential, but, combined with population growth, it threatens our "global village" with resource depletion and catastrophic climate change, as well as with serious pollution at more regional and local levels.

These concerns were of course central to the agreement on sustainable development reached at the Rio Earth Summit in 1992. This committed the international community to work for more sustainable patterns of consumption and production, for the benefit of present and future generations alike. The UK was one of the first countries to translate this into a national strategy, making the concept of sustainable development the touchstone of our policies. Working to make industry and commerce inherently cleaner is an integral part of that strategy.

In the world of environmental policy there are many prophets of doom. But the message of Cleaner Production is an optimistic one. By careful attention to process design and management, industry can reduce its environmental impact and improve productivity at the same time. Rather than cleaning up waste, we can prevent it. Rather than using resources unproductively on elaborate "end-of-pipe" techniques of pollution control, we can reduce or eliminate waste and pollutants at source.

The role of governments singly and collectively is to create the conditions in which industry is encouraged to adopt cleaner production methods. How can they do this? I will mention three important areas.

An appropriate and effective framework of environmental regulation is one prerequisite to achieving cleaner production. In the UK, the newly created Environment Agency has, since April this year, taken over from its predecessors the task of applying our system of Integrated Pollution Control (IPC).

IPC sets up a steady but firm pressure on the regulated industries to reduce and ultimately eliminate releases of the most polluting substances.

We must all be ready to exchange our experience of environmental regulation. For example, I am very pleased that the UK has established excellent contacts with the National Environmental Protection Agency of China.

Direct regulation is essential, but the UK government believes that this should be kept to a minimum. Where possible, economic forces should be harnessed to achieve policy objectives. There is a balance to be struck, and different countries will take different views on just where it should lie at any point in time.

Another essential factor in achieving cleaner production is information on the techniques available. Not just information in any form. A crucial need is for objective information in a simple, easily assimilated form appealing directly to key decision makers. Well presented case studies and simple guidance material can seize the attention of the hard pressed decision makers in industry, where text books will not. Once busy decision makers are convinced of the potential business benefits of cleaner production, they can be signposted to sources of fuller information.

The UNEP Cleaner Production Programme responds to this need for information, both in encouraging member countries to develop national programmes, and by providing information direct to industry. In the UK, two years ago, my Department and the Department of Trade and Industry launched our Environmental Technology Best Practice Programme, to promote techniques for waste minimization and cleaner technology. We see the programme as forming the UK's Cleaner Production Centre.

In considering your recommendations for the future of the programme, you will need to think about the right balance – within the available resources – between direct outreach to industry and indirect action through national centres or in other ways.

One measure of the success of the seminar will be realistic but cogent recommendations for the future of the Cleaner Production Programme that can be fed into the 19th Governing Council. The Council will need to consider the way forward on the Cleaner Production Programme as part of the larger context of the Programme of Work for the 1998/99 biennium. Another important measure of success will be the new contacts established in Oxford, between people with similar issues to confront but with interestingly different ways of tackling them. ◆

Sustainable production and consumption

Current trends in population, industrialization and consumption release wastes and pollutants faster than the Earth can absorb them. Natural resources are consumed faster than they can be restored. The need to reorient production processes, products and services as well as consumer demand is a key issue on the sustainable development agenda. Recognized at UNCED in Rio, Sustainable Production and Consumption has been identified as one of the five priority work programme areas for UNEP. The Cleaner Production Programme undertaken in Industry and Environment is one of the activities within this area.

How is cleaner production different?

Much of the current thinking on environmental protection focuses on what to do with wastes and emissions after they have been created. The goal of cleaner production is to avoid generating pollution in the first place – which frequently cuts costs, reduces risks, and identifies new opportunities.

The following members of the Cleaner Production Programme contributed to the organization and coordination of the Seminar:
Ms Jacqueline Aloisi de Larderel, Director, UNEP Industry and Environment, Executive Coordinator, Sustainable Production and Consumption; Mr Jonathan Hobbs, Coordinator Cleaner Production; Ms Chizuru Aoki, Environmental Affairs Officer; Mr Sybren de Hoo, Senior Consultant; Mr Dong-Won Shin, Senior Consultant; Mr Uno Abrahamsen, Senior Consultant; Ms Garrette Clark, Research Assistant; and Ms Natalie Taconet, Secretary. Secretarial assistance for the seminar was provided by Ms Nancy Wachira.

Cleaner production can be the most efficient way to operate processes, produce products and provide services. Costs of wastes, emissions and environmental and health impacts can be reduced, and benefits from these reductions and new markets can be realized.

Cleaner production efforts so far have focused on supplying governments and industry with demonstrations and information on how to implement cleaner production and on the positive results that can be achieved. The challenge now is to focus on the demand side, e.g. permits, procurement, supply chain management, environmental management, multilateral as well as private banks. This will represent the main challenge for the next two years.

Eco-efficiency starts from issues of economic efficiency which have positive environmental benefits, while **cleaner production** starts from issues of environmental efficiency which have positive economic benefits. Both strategies are win-win approaches.

Cleaner production, a concept introduced by UNEP Industry and Environment in 1989, is the continuous application of an integrated preventive environmental strategy to processes, products

Cleaner production highlights

1. Definition of concepts, creating awareness and information exchange

- Publications: *Government Strategies and Policies for Cleaner Production, Cleaner Production Worldwide I and II, Cleaner Production in the Asia Pacific Economic Cooperation Region, Cleaner Production in the Mediterranean Region, Cleaner Production in China. A Story of Successful Cooperation, Life Cycle Assessment: What it is and How to do it, Ecodesign: A Promising Approach.*
- Cleaner Production Newsletter.
- International Cleaner Production Information Clearinghouse (ICPIC).
- A diskette version of ICPIC containing
  - 350 technical case studies
  - 20 policy case studies
  - 550 publications abstracts
  - list of 110 expert institutions
  - listing of UNEP IE resources.
- An Internet connection (icpic@unep.fr) enables users to pose questions about cleaner production.
- More information about the Cleaner Production Programme and UNEP IE can be accessed on the World Wide Web (at http://www.unepie.org).

2. Capacity building

- Nine working groups on cleaner production identify and supply technical expertise, advice and information to support implementation of cleaner production: Leather Tanning, Textile, Metal Finishing, Pulp and Paper, Biotechnology Industry, Food Industry, Sustainable Product Development, Education and Training, Policy, Strategy and Instruments.
- Joint UNIDO/UNEP National Cleaner Production Centres (NCPCs) have been established in nine countries: Brazil, China, the Czech Republic, India, Mexico, the Slovak Republic, Tanzania, Tunisia, Zimbabwe. Additional centres are planned in developing countries and countries in transition to implement cleaner production.
- 43 NCPCs or organizations dealing with cleaner production in 37 countries are involved in CP network.
- Organization of and contribution to international conferences, workshops and seminars on cleaner production.

3. Demonstration projects

In the period 1993-1996, UNEP IE, in cooperation with the National Environmental Protection Agency of China, the China National Cleaner Production Centre, and the World Bank, developed a systematic approach to cleaner production in three different geographical areas: Beijing, Shaoxing and Yantai. The project has included training of professionals, assessments, creating a network of Chinese institutions, and policy studies.

The results of the project will now act as a springboard for additional bilateral and multilateral efforts to disseminate cleaner production more effectively in China.

and services to increase eco-efficiency and reduce risks for humans and the environment. It applies to:

- production processes: conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes;
- products: reducing negative impacts along the life cycle of a product, from raw materials extraction to its ultimate disposal;
- services: incorporating environmental concerns into designing and delivering services.

Cleaner production requires changing attitudes, ensuring responsible environmental management, creating conducive national policy environments, and evaluating technology options. ◆

Eco-efficiency

The concept of eco-efficiency was developed, notably, by the World Business Council for Sustainable Development (WBCSD) in 1992 in its landmark report, *Changing Course*. It was further defined at the first Antwerp Workshop on Eco-efficiency, held in November 1993, as being reached by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity, throughout the life cycle, to a level at least in line with the Earth's estimated carrying capacity.

The WBCSD has identified seven success factors for eco-efficiency:

- reduce the material intensity of goods and services;
- reduce the energy intensity of goods and services;
- reduce toxic dispersion;
- enhance material recyclability;
- maximize sustainable use of renewable resources;
- reduce material durability;
- increase the service intensity of goods and services.

These elements clearly build upon, and help further, the successful United Nations cleaner production initiatives towards sustainable production and consumption patterns.

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Fourth High Level Seminar on Cleaner Production: Presentation

This special issue of *Industry and Environment* highlights the Fourth High Level Seminar on Cleaner Production, which was held in Oxford, United Kingdom, from 23 to 26 September 1996.

Organized by UNEP Industry and Environment, this event was hosted by the Government of the United Kingdom and was attended by approximately 170 participants from over 50 countries. These participants covered various sectors involved in the Cleaner Production network, such as governments, industry, non-governmental organizations (NGOs), the banking sector, and international organizations.

The specific objectives of the seminar in Oxford were two-fold:

- to review and evaluate the progress of worldwide cleaner production initiatives in the past two years and to assess obstacles as well as opportunities for further development; and
- to recommend future orientations for the Cleaner Production Programme, based on this review and evaluation.

Regional preparations

At the last seminar, in Warsaw, there was a strong push for having a more regional approach and an organized input comparing the situations in the different regions of the world. Regional status reports were developed through regional conferences.

Regional conferences were organized for:

- the Eastern and Southern African Countries, Nairobi, 21-24 November 1995;
- the Mediterranean Region, Rome, 17 May 1996;
- Western Asia, Abu Dhabi, 10-12 June 1996;
- Asia and Pacific Region, Bangkok, 22-23 August 1996.

Some other regions were covered by other CP events such as:

- Workshop on Waste Minimisation and Cleaner Production in Latin America and the Caribbean, Mexico, November 1995;
- North America, Pollution Prevention Roundtable, Washington, DC, 10-12 April 1996;
- Europe, the Environmental Action Programme for Central and Eastern Europe and the European Roundtable Movement on Cleaner Production.

In addition to the cleaner production Regional Perspectives provided from the Mediterranean, African, West Asia, Latin American/Caribbean, European, North American and Asia/Pacific regions, the plenary sessions covered five main issues: Cleaner Production Working Groups, Innovation for Sustainable Production and Consumption, Instruments for Promoting Cleaner Production, Beyond Demonstration, New Horizons in Sustainable Production and Consumption, and Creating New Partnerships.

Eight parallel sessions provided smaller, interactive settings for participants to exchange experiences and ideas: Designing Cleaner Products, Experiences in Establishing Cleaner Production Activities, The Role of Engineers in Promoting Cleaner Production, Greening of the Development Banks: Implication for Cleaner Production Activities, Cleaner Production: Education and Training, Biotechnology for Cleaner Production, Greening of the Service Industries: The Case of Tourism, and Innovative Financing for Promoting Cleaner Production.

Conclusions and recommendations from the seminar addressed all partners involved in the Cleaner Production network, including other UN organizations.

The following pages present a summary of the presentations, a synopsis of conclusions and recommendations, and a selection of written contributions.

We at UNEP aim to provide with current information on what is happening in the world of cleaner production. Most important is that, through reading this issue, many of you will obtain a better understanding of what cleaner production is all about and may as a result be motivated to consider introducing cleaner production in whatever organization you work within, in the public or private sector. ◆

Thank you

UNEP would like to offer its sincere appreciation to the Government of the United Kingdom for hosting this event. Special thanks are due to Mr John Hobson, Director, Environment and Energy Market Innovation Division, and to Mr John Thompson, both at the Department of the Environment, as well as to Mr David Pounder and to the staff of the Institution of Mechanical Engineers for their invaluable assistance through the preparation period and the holding of the seminar.

The Cleaner Production Programme has also been advised by a number of senior experts: Mr Allen Aspengren, Prof. Osama El-Kholy, Prof. Donald Huisingh, Mr Ken Geiser, Ms Kirsten Oldenburg, Mr David Pounder, Prof. Zygfryd Nowak and Mr Claude Fussler.

UNEP thanks them for their most valuable contribution.

Last but not least, UNEP would like to thank all the chairpersons, speakers and participants for their valuable input and guidance.

Keynote address

The three orbits of sustainability

Claude Fussler
Vice President, Environment, Health and Safety, New Businesses and Public Affairs, Dow Europe S.A., Bachtobelstraße 3, 8810 Horgen, Switzerland

One of the primary issues associated with sustainable development that we continue to wrestle with is how to move towards sustainability without compromising sound business management principles – principles which help companies succeed and ultimately form the bedrock of a healthy economy.

It is possible to achieve sustainability and economic growth without compromising either.

To explain how this can be done, we employ a model known as the *Three Orbits*. It's possible to view each of the orbits in the model as independent, but if we are to take a broad view of sustainability we must realize that they exist in a highly interdependent universe, each relying on the other for the gravitational pushes and pulls necessary to bring the vision of sustainability to life.

The first orbit: sustainability in the marketing domain

A sustainable business, like any other business, must first orbit around the monetary domain, its centre of gravity. However good "sustainable" products or services might be, they won't change the world if companies can't make a profit from them. They will remain stillborn or, worse, bankrupt the company. Profits are essential to reward shareholders and employees and to provide funds for investment in future breakthrough innovations.

The first, central, orbit is within the marketing domain. It is the key factor. Sustainable business development is the same as any business development. It must identify market opportunities and innovate to seize them.

The second orbit: moving towards excellence

The move towards sustainable development will often be similarly "unintentional". But sustainable business development makes the process intentional. It seeks and creates opportunities to force the pace.

By doing so it moves into the second orbit. There management excellence is the key factor. There you need a leadership capability that not only masters the success rules of the market but sets results oriented goals – ambitious goals. A leadership that empowers employees, aligns resources with strategy, and drives a process of continuous improvement.

An environmental policy is adopted, and the quality culture and discipline are extended into environmental management systems, improvement targets and public reporting.

The third orbit: extending the horizons, strengthening the vision

The third orbit involves four crucial changes. All require business to stretch from the familiar domains of marketing and management and enter the *terra incognita* of public policy and non-governmental organizations (NGOs). The changes are:

- working with policy-makers and NGOs to develop regulations which drive towards sustainable development but also maximize flexibility and opportunity for business;
- establishing dialogue and partnership with NGOs and other stakeholders to learn, influence, and gain early warnings of how public opinion and customer values might shift;
- considering the whole life cycle of products and services, and working with suppliers and others to minimize the total burden you put on the earth;
- building your own long-term vision of a sustainable future and the role of your business.

The orbits work in harmony

This third orbit does not replace the first or second orbits, but incorporates them. The marketing domain remains crucial. One cannot discount the rules of the monetary domain. New public policy initiatives will only work if they allow business to create new sources of customer value and improve their cost effectiveness in the long run. If not, the third orbit will collapse from within its core.

Government regulation is necessary to create a framework for making decisions and a base line you can't fall below. If we want to get the benefits from free trade without mortgaging the environment in some regions of the world, we will need minimum global standards. And harmonized commitment and enforcement to drive out the "free riders".

Aligning business and public policy objectives

The third orbit also involves alignment of public policy objectives and business leadership. They merge into a governance consensus. They have common long-term priorities. They do not work against or past each other any more.

One means of implementing this alignment is through explicit agreements between business leaders and policy-makers. These set exacting long-term goals for business, but provide flexibility and responsibility in achieving them.

From conflict to partnership with stakeholders

Stakeholders are the organizations and individuals whom your actions affect and who can help or hinder your pursuit of your objectives. The third orbit is smoothest when you identify who they are and talk to them.

NGOs are the key partners for eco-innovation. They represent aware and motivated citizens. They shape public opinion, customer values, and policies. Dialogue with NGOs can provide early warnings of how this might shift.

The role of NGOs is crucial in maintaining the issue of sustainable consumption and production on the policy agenda. Their vitality and creativity are a source of inspiration and ideas. They can help in exploring new product and service avenues. They can validate consumer reactions in advance and decrease the risk in new business launches. They can provide reliable insight into some of the more difficult sustainability criteria, like danger to species or social impact in developing countries.

A life cycle perspective

A life cycle perspective leads naturally to greater cooperation with customers and suppliers to minimize overall impacts. Large companies have a particular opportunity – and a responsibility – to support their small to medium-sized suppliers in making environmental improvements and accepting their social responsibility. This creates a dynamic network of creative enterprises that stimulate each other in continuous improvements. A life cycle perspective requires internal changes. Sustainable development requires redesign of products and processes.

A vision of sustainability

Vision is critical in the third orbit. A vision of:

- shared responsibility by business and political leadership to create a better legacy;
- a stronger social sensitivity in business;
- a long-term perspective of the sustainable development imperative.

We must create a process which shifts people's horizons from the short-term, the current product, and today's processes to one which lets them see – with their own eyes – the long-term trends and the threats and opportunities they create. Gives them space and incentive to consider the arguments for "factor four" or "factor ten" improvements and the need to provide socio-economic security for the disadvantaged. And allows them to explore the implications for long-term competitive strength, for products and services, jobs and personal contributions.

Meeting the challenge requires business skills, leadership capacity, and a governance model that operate in full synergy. And it requires that our sights be continuously on the eco-compass in order to lead business development with a long-term purpose.

Fourth High Level Cleaner Production Seminar

23-26 September 1996, Oxford, UK
Summary Report

Résumé

Le quatrième séminaire de haut niveau du PNUE sur la production plus propre s'est tenu à Oxford du 23 au 26 septembre 1996, à l'invitation du gouvernement britannique. Quelques 170 délégués de plus de 50 pays ont fait le bilan des progrès réalisés dans ce domaine, constaté les obstacles empêchant de plus grandes avancées, et déterminé les mesures permettant de les surmonter. Séances plénières et parallèles ont apporté la preuve d'un progrès sensible de ce type de production dans tous les domaines d'activité et ont fait le point des besoins régionaux en la matière. Parmi les sujets abordés figuraient le rôle des ingénieurs et techniciens pour promouvoir la production plus propre, les effets d'une orientation environnementale de plus en plus marquée des banques de développement et des secteurs de service tels que le tourisme, l'éducation et la formation, ainsi que les modes de financement novateurs encourageant la production plus propre. Des conclusions importantes ont été tirées des travaux de ce séminaire, notamment : une approche plus nettement orientée sur la consommation, la promotion des instruments favorisant la production plus propre et une plus grande communication entre les centres nationaux de production plus propre. En outre, Il a été proposé que les groupes de travail du PNUE élaborent des instruments de référence de la production plus propre. On trouvera un rapport complet de cette manifestation de trois jours dans les pages qui suivent.

Resumen

El Cuarto Seminario de Alto Nivel de la UNEP sobre la producción más limpia, organizado por el gobierno del Reino Unido se celebró en Oxford del 23 al 26 de Septiembre de 1996. Asistieron aproximadamente unos 170 delegados de más de 50 países que analizaron y evaluaron el progreso de las iniciativas en la producción de limpiadores e identificaron los obstáculos que pudieran surgir en el futuro y las medidas para superarlos. Las sesiones plenarias y paralelas evidenciaron un progreso significativo en la producción de limpiadores en todas las esferas sociales y también ofrecieron información sobre las necesidades de la producción de limpiadores a nivel regional. Los temas de debate incluyeron el rol de los ingenieros en la promoción de la producción de limpiadores, las implicaciones de las actividades de producción de limpiadores en los bancos de desarrollo y en las industrias de servicios como el turismo, la educación y el aprendizaje y las novedosas financiaciones para promocionar la producción de limpiadores. Algunas importantes conclusiones del Seminario han sido: fomentar un mayor énfasis en el consumo, la utilización de medios para promocionar la producción de limpiadores y lazos más estrechos entre los Centros de Producción de Limpiadores Nacionales. A los grupos de trabajo de la UNEP se les aconsejó que desarrollaran herramientas que marquen un hito en la producción de limpiadores. En las próximas páginas ofrecemos un informe completo de los tres días que duró el evento.

Introduction

In 1990, UNEP IE launched its Cleaner Production Programme at an international seminar hosted by the UK Government (Canterbury, September 1990). Its goal was to shift the global emphasis of end-of-pipe solutions to an at-source, cleaner production approach. UNEP IE then committed itself to regularly monitor and report on its progress to the international community every two years. The biannual international Cleaner Production Seminars have since been hosted by the French and Polish Governments (Paris 1992, Warsaw 1994). The UK offer to again host the international seminar provided a particularly symbolic opportunity for UNEP and the international cleaner production community to see how far it had come in institutionalizing cleaner production in their countries in six years.

Claude Fussler, Vice-President, Environment, Health and Safety, New Business and Public Affairs, Dow Europe, provided the keynote address to the conference. He used a three-orbit model to demonstrate that cleaner production is about revolutionizing business by complementing what business already does well. Business's first orbit revolves around its ability to identify market opportunities in order to generate profit to stay in business. Sustainable business development helps

Ms Elizabeth Dowdeswell, Executive Director, UNEP, chairing the panel discussion on "Cleaner production developments and needs".

Designing cleaner products

Chair: Dr J. C. Van Weenen, UNEP Cleaner Production Working Group on Sustainable Product Development

Cleaner product design is a key aspect of cleaner production which is receiving increasing attention. Cleaner product design strategies can include changes in product components (e.g. low-impact materials, reduction of materials, improved production techniques), changes in product structure (e.g. more efficient distribution system, reduced environmental impact at user stage, optimised lifetime or end-of-life systems), and changes in product systems (e.g. de-materialisation, shared use, integrated functions). Which strategy will be used will depend on the product itself, or external pressures (e.g. legislation, consumer demand, technology innovation), and internal drives (environmental management objectives, quality improvements). A UNEP Working Group on Sustainable Product Development was created as a part of the Cleaner Production Programme in 1994. It has developed a worldwide network of industry, government and academic experts in product design and has created a data base of case studies of sustainable products.

Following an overview of the recent developments of cleaner product design and policy developments by the chairman, Dr D. Wienke, Project Manager, Sony Environmental Center, shared his company's experience and goals in designing cleaner consumer electronic products. Initially focusing on substitution of hazardous materials such as dangerous flame retardants and PVCs, a more proactive policy has led to a broader environmental approach, leading to the design of products, such as computer monitors and TV sets, which are easier to disassemble and recycle, and use less energy. He noted that miniaturisation of products, however, while using less materials, lends to more complex products and reduces their recyclability.

Mr P.L. Coutrier, Deputy Head of BAPEDAL for EIA and Technical Guidance, Indonesia, provided an Asian government policy perspective. He reviewed the development of numerous initiatives underway in Indonesia and the region to encourage the design of cleaner products. He stressed the importance of economic incentives, partnership between all stakeholders, and the integration of cleaner production into all economic and development policies.

Key conclusions from this session were:

- In addressing cleaner product design, there is a necessity to address products, their production processes, and their management in one package.
- Material changes and reductions have already delivered substantial improvements in several products.
- All design strategies should be analysed in their results through an LCA because trade-offs have to be made all the time. Miniaturisation, for example, brings low materials and less energy use, but also less recyclability and more complex management.
- A change in focus should be made from cleaner processes and technologies to cleaner products and to consumer behaviour.
- Eco-efficiency on its own will not be enough to achieve global environmental sustainability.

move business into a second orbit, where management excellence is needed for long term strategy and competitiveness. The third orbit extends business horizons beyond marketing and management factors towards three critical factors of future success. The first lies in developing a vision not only of long-term business success but also an understanding of society's objectives and criteria for success. The second is the ability to use new tools such as cleaner production or eco-efficiency to look at what can be produced, consumed and marketed sustainably. And the third represents the need to work with unfamiliar partners to align business strategies with social strategies. This requires dialogue with governments, NGOs, and other stakeholders to learn how customer values might shift.

Sustainable business development requires a firm hold in all three orbits, and needs to be based on six ECO principles:

- Eco-efficiency = sustainable goods using less and less resources.
- Customer/consumer = focus on long-term needs of tomorrow, consumed sustainably.
- Objectives = targets are needed to measure factor 4, 6, or 10 improvements over the next 30 years
- Empowerment = of employees who can take responsibility which is needed for business success.
- Care = principles of equity and making society better need to be incorporated into central decision-making practices together with business success.
- Out of the box = role of innovation, have to invent solutions at a greater rate.

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Jacqueline Aloisi de Larderel, Director, UNEP IE, provided an overview of the vision, objectives, strategy and work programme of the Cleaner Production Programme. The vision is to recognize cleaner production as the only path to sustainability. Cleaner production reconciles economic development with environmental protection, contributes to the implementation of international conventions (e.g. hazardous waste, energy efficiency, natural resource preservation), and is incorporated throughout Agenda 21. The Programme objectives are to build consensus and awareness, develop capabilities, demonstrate in the field and catalyze implementation of cleaner production worldwide. The strategy is to start small and think big, building strategic alliances (with other UN and intergovernmental agencies, industry, NGOs, etc.) and targeting key decision-makers who could help in promoting the cleaner production concept. The work programme to date has included information dissemination, publications to explain and show cleaner production at work, capacity building with UNIDO, and demonstration projects with the World Bank. To make more widely accessible the information contained in the International Cleaner Production Information Clearinghouse (ICPIC), one aspect of UNEP's broad information dissemination activities, a diskette version is now available and is already proving to be more successful than the former on-line system.

This conference provides a new landmark for the future development of UNEP's Cleaner Production Programme. The expected outcome is an assessment of progress and results in the adoption of cleaner production worldwide, an assessment of barriers still to overcome, and a review of the Cleaner Production Programme's vision, objectives, strategy and work programme.

Regional perspectives and roundtable

Chair: Ms Elizabeth Dowdeswell, Executive Director, UNEP

The first main plenary session of the conference reviewed the extent to which cleaner production is being adopted in the different regions of the world. Cleaner production pioneers have successfully shaped the international agenda, integrating environment into other policy sectors and making the preventive approach a priority. It is clear that cleaner production is now in an implementation phase and an exchange of regional perspectives provides an opportunity to learn from each other, and find out what does and doesn't work in different situations. This is also of interest to the CSD, which is currently preparing for next year's special session of the General Assembly which means to review the international community's progress in implementing Agenda 21.

At the end of the session and discussions, Ms Dowdeswell concluded that there is a definite move towards cleaner production in all regions and that a number of important lessons had been shared. GDP growth and the heavy cost of clean-up are key driving forces for cleaner production. An increasing number of strategic alliances are coming to life. Active participation of industry in cleaner production centres and workshops is

Participant good news story: Asian region

Cleaner production in Asia is on many people's minds and there is a great deal of activity underway. The need and potential for cleaner production are great. The Thai government, Asian Development Bank and UNEP (with other partners) will conduct an Asia Pacific Roundtable on Cleaner Production in November 1997 to push the cleaner production concept further.

increasing. New groups, such as trade unions and consumers, have become involved in cleaner production activities, but need to become more involved. Industry is independently taking in-house cleaner production initiatives, and is requesting benchmarks to know what can be achieved. Several continuing needs have also been identified along with recommendations to help meet them. These include: a shortage of information and the need to build networks to share information and build confidence; an ongoing need for local capacity building, involving universities, technical training and institutions, e.g. UNEP/UNDIO NCPCs; and a request to strengthen regional level UNEP offices, environment institutions, universities, information sharing forums.

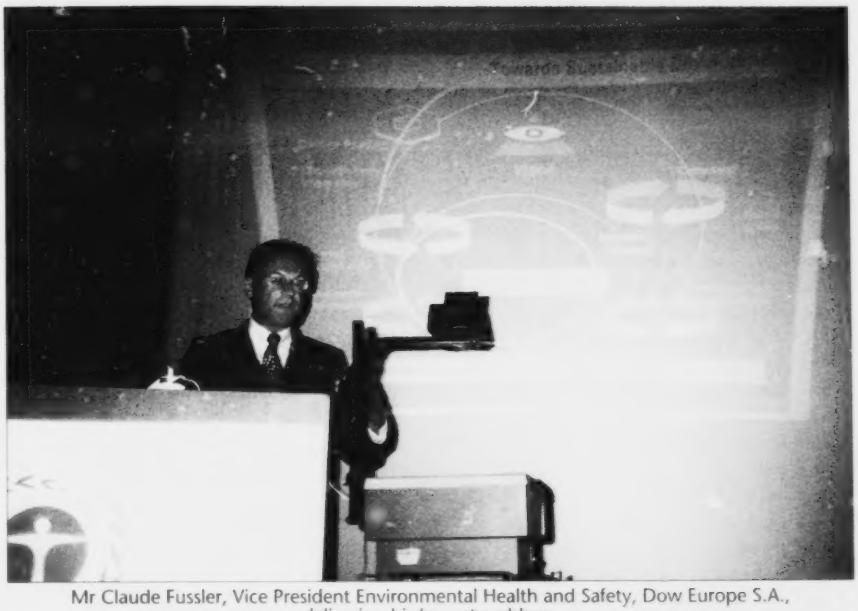
Mediterranean region

Mr A. Hamza, Special Technical Advisor, Egyptian Pollution Abatement Project, Egyptian Environmental Affairs Agency, provided a perspective from the Mediterranean region.

Cleaner production has stimulated a lot of interest in the Mediterranean region, particularly among the non-European Mediterranean countries where environment degradation is the most pronounced, for several reasons. These include: average annual GDP growth averages 3.8 per cent – mostly due to growth in industrial, agriculture and tourism sectors; most industries are in the heavily polluting sectors, leading to heavily concentrated areas of pollution, such as Cairo, where the level of lead in the air and in workers' blood is 10 and 8 times the WHO standard respectively; the cost of clean-up of existing pollution is high; and policy instruments are characteristically weak.

Since 1993, the region has seen a leap in cleaner production initiatives. Egypt launched a US$ 165 million pollution prevention programme in 1994. Tunisia established a UNEP/UNIDO National Cleaner Production Centre. Malta established a Cleaner Technology Centre in 1993. The Catalonia and Basque region has established a Centre for Cleaner Production Initiatives. Turkey is currently planning to establish a cleaner production centre. An international network for cleaner production in the Mediterranean and Black Sea region is being developed. Multilateral and bilateral assistance programmes are placing a greater emphasis on cleaner production investments. In Egypt alone, the World Bank is facilitating cleaner production investments with a $35 million loan. Several European Union programmes are directly or indirectly financing cleaner production initiatives in urban and industrial centres in the region.

To accelerate the adoption of cleaner production in the area, Mr Hamza identified several needs. A review of existing economic incentives to investors is needed to ensure that industrial investments incorporate cleaner production. Training of industry personnel needs to be strengthened. Public awareness and access to information needs to be enhanced to help create the demand for cleaner production. Legislation and its enforcement need to be strengthened.



Mr Claude Fussler, Vice President Environmental Health and Safety, Dow Europe S.A., delivering his keynote address.

Participant good news story: Philippines

The Philippines has some solid data that can demonstrate cleaner production pays. Out of an aggregate investment of US$ 20 million by 110 participating companies in the USAID funded industrial environmental management project (IEMP), the annual benefit is US$ 30 million due to reduced cost of pollution abatement. This is a potent factor in convincing other businessmen to move towards cleaner production. Additional good news is that this instrument has resulted in a 30 per cent reduction of pollution.

Africa

Prof. C.L.C. Migiro, Director, UNIDO/UNEP National Cleaner Production Centre, Tanzania, illustrated how cleaner production has been "percolating through the machinery and systems of governments, public and private enterprises, chambers of commerce and industry, public and non-governmental organizations" in Africa by providing some country and regional examples. Most governments in the region have encountered cleaner production in one way or another in the process of establishing and implementing their Agenda 21 National Environmental Action Plans. Cleaner production activities in the region fall in the categories of cleaner production centres, donor funded demonstration projects, and private sector initiatives. There are three UNEP/UNIDO NCPCs in Africa – Egypt, Tunisia and Zimbabwe – organizing in-plant demonstrations, awareness seminars, and training workshops in their countries.

Participant good news story: Tanzania

The Tanzania UNEP/UNIDO National Cleaner Production Centre was inaugurated by the Vice President of Tanzania.

Ethiopia has two institutions, the Chemical Society of Ethiopia and the Chem Tech Center, actively promoting cleaner production, conducting seminars, advising governments, designing industrial training packages. Southern Africa has a dynamic private sector initiative, the Industrial Environmental Forum of South Africa, formed by business leaders committed to continuous improvement, self-regulation, and openness in environmental performance. It conducts a multitude of activities to raise environmental awareness, develop management tools and skills, and influence government policies. A one-year Cleaner Environmental Production pilot project was launched in Tanzania in 1994 with financial assistance from the Danish government. It identified a total of 169 cleaner production options in 12 companies, 105 of which were considered economically feasible by the companies concerned. The Tanzania NCPC, established a year later, is providing follow-up to the project and using the results in its other training, awareness raising and demonstration activities. Norwegian donors assisted Zambia in carrying out environmental management audits in about 20 industrial enterprises with positive results.

Two regional workshops were held in 1995: one on cleaner and safe production organized by UNEP's Regional Office for Africa and one on environment management capacity building organized by several non-governmental organizations. Mr Migiro emphasized the need to enhance cleaner production activities in the region and called for a strengthened role for UNEP ROA and the involvement of other organizations in the region to promote cleaner production.

West Asia

Mr Yousef Hamed Mashal, Chairman and Managing Director, Mashal International, Bahrain, provided the West Asia region's perspective. The region, 11 countries plus the Palestinian Authority, has an economy heavily dependent on petro-

Experiences in establishing cleaner production activities

Chair: Mr K. Miller,
Manager, Environment, Health and Safety, Europe, 3M Europe

Since UNEP launched its Cleaner Production Programme in 1989, a variety of cleaner production activities have been undertaken in numerous countries, often with the assistance of bilateral donor organisations. These have covered a range of activities including demonstration projects, awareness raising, training and technical assistance and institutional capacity building, each targeting specific audiences such as government policy-makers, company decision-makers and employees, technical and academic institutions, etc., all with the same end-goal: to institutionalise cleaner production within a country or industry.

Mr Jim Gallup, USAID Project Officer of the Environmental Pollution Prevention Project (EP3), drew the lessons learnt from established programmes in Chile, Tunisia, Ecuador, Egypt, Indonesia, Bolivia, Paraguay, long-term initiatives in Mexico and Peru, and smaller activities in Sri Lanka, Thailand and Zambia. He stressed that one-time assessments or demonstration projects will not be able to institutionalise cleaner production without supportive changes in the country's economic and regulatory framework at the local, regional and national level. Donor countries need to foster in-country demand for cleaner production as well as provide technical support by trying to influence government policy and industry behaviour.

Mr Romuald Michalek, Vice President, Technical Programs, World Environment Center, described his organisation's cleaner production activities in nine countries of Central and Eastern Europe, where it has established and continues to financially support eleven pollution prevention centres. WEC has had success by first demonstrating the cleaner production concept via pilot projects at selected plants and subsequently introducing it to a broad number of industries. Industry has responded to 41 WEC pilot projects by implementing 146 projects on its own. Dissemination of information to plant mangers, improved cooperation and co-ordination among local and foreign donor organisations, support by local governments and foreign donors to pollution prevention centres, and new legislation to provide economic incentives are essential.

Mr Olav S. Nedenes, President, World Cleaner Production Society, summarised the Norwegian Government's cleaner production programmes in Poland, the Czech and Slovak Republics, Lithuania, Russia and China. The programmes aim at implementing economically profitable and environmentally favourable industrial restructuring and the training of enough highly qualified local cleaner production advisors in each country to enable the dissemination of cleaner production throughout the relevant industrial enterprises. He emphasised the need for all industrial grants and loans to be linked to mandatory cleaner production assessments to ensure the replication of cleaner production initiatives into all a company's processes.

Common lessons learnt from these experiences include:

- The need to be flexible. Once started, a cleaner production programme should be able to adapt to the country-specific situation.
- The need to get buy-in, literally. For example, USAID's EP3 programme in Chile was established in an industry association which sells its cleaner production services. The WEC model requires that the benefiting company financially contributes to the cleaner production assessment.
- It is critical to sell the concept of cleaner production to plant managers as a good business tool, in addition to being an environmental management tool.

It is equally critical to simultaneously promote cleaner production to all other stakeholders, to stimulate market demand and the right kind of government policy framework while building institutional capacity to implement cleaner production.

leum, petrochemical and other energy intensive industries which have been generating an increasing amount of hazardous wastes. Consequently, there is a growing need for cleaner production. A first cleaner production seminar was organized in the region in June by UNEP and the United Arab Emirates government. In addition to a discussion of the region's needs and cleaner production applications and strategies, the seminar presented some early cleaner production case studies in the region, such as a Aluminum Bahrain, which decreased the amount of gas needed to produce aluminum by 50 per cent per tonne, and Dubai Cable, which successfully reduced its scrap metal from 15 to 3.6 per cent.

To accelerate the adoption rate of cleaner production in the region, the following needs were identified: a regional cleaner production information databank to overcome the shortage of reference material, strengthened government support and enforcement of environment legislation, training for local capacity building and awareness programmes, financial support to offset the tendency of low-bid contractual arrangements to overlook cleaner production. Recommendations included: establishing a regional cleaner production centre in co-operation with UNEP, environmental enforcement and compliance capacity building, technical training programmes, publication of regional cleaner production case studies, and strengthening of environment institutions and NGOs to develop human resources to be able to promote cleaner production in the region.

Participant good news story: Chile and Mexico

Chile is developing a national policy for cleaner production in industry. Mexican companies have carried out more than 600 environmental audits and have a voluntary agreement with government to implement cleaner production options identified.

Latin America/Caribbean

Dr C. Cortinas de Nava, Instituto Nacional da Ecologia, Mexico, presented the outcome of the Workshop on Waste Minimisation and Cleaner Production in Latin America and the Caribbean hosted by Mexico in November 1995. After becoming a member of the OECD in 1994, Mexico attended an OECD workshop on cleaner production. Finding that the cleaner production case studies presented at the workshop had little in common with Mexico's own situation, Mexico decided to invite other members of the Latin American/Caribbean region to identify common problems and solutions. Member countries of the Pan-American Network for Waste Management, formed in 1994, participated in the workshop. The workshop covered a wide variety of issues on adopting cleaner production in a number of industries. It became clear that export industries were more informed and more motivated to adopt cleaner production because of their international links and need to remain competitive. Participants identified common barriers to the adoption of cleaner production in their countries among government, industry, consultants, education and research institutions, consumers, public interest groups, bilateral and multilateral cooperation organizations, capital markets and insurance companies.

The workshop concluded that participants shared a common background as former colonies of industrialized countries. Technology was imported from the industrialized countries which was often inappropriate to the importing countries' environmental situation, often resource intensive or heavily polluting. The problem is being repeated in efforts to change these technologies as cleaner technologies and consultants are often brought in from countries outside the region. To build local capacity to develop appropriate cleaner production, participants provided a number of recommendations to improve national capacities and regional cooperation. Since then, the Mexico Cleaner Production Centre was established in December 1995, voluntary agreements on environmental protection and industrial competitiveness are being developed, and a training programme is underway to reduce hazardous waste in six industrial sectors.

European region

Ms V. Burchard, Danish Steering Committee of the Third European Roundtable on Cleaner Production (ERCP), showed how a roundtable model was providing a European platform for the sharing of cleaner production experiences in the region. Following the successful model of

pollution prevention roundtables in the US, the European Roundtable on Cleaner Production was established in 1994. It is a non-profit organization, based on voluntary work, paid for by participants and funding from countries hosting the annual roundtable meeting. The focus is exclusively on cleaner products, processes, and services. The roundtable is hosted by different countries each year (Austria, 1994, Netherlands, 1995, Denmark 1996). Each meeting is actually a forum of many roundtables within the Roundtable, providing an opportunity for people to meet in small groups to discuss specific topics of interest. Participants come from a broad range of backgrounds (industry, governments, consultants, education and research, NGOs) and from all European countries (east, west, north, south) with invited guests from other countries around the world.

Mr K. Michalak, Environment Directorate, Non-Member Countries Division, OECD, provided a focus on Central and Eastern Europe and the newly independent states of the former Soviet Union. Following the changes in Central and Eastern Europe, and recognizing that environmental progress and consumption-based strategies could potentially be offset by non-progress elsewhere, the OECD began to develop an assistance programme for non-OECD countries where there was great scope for eco-efficiency improvements. Since 1993, the OECD has been reviewing cleaner production practices in Central and Eastern European countries and producing guides for setting up cleaner production programmes. The Environment Action Plan Task Force work programme calls for the implementation of cleaner production in all CE countries by 1998, with the objective of achieving a basic level of capacity to further disseminate the cleaner production concept and principles throughout industry. It includes activities to establish policy and regulatory frameworks, to generate commitments for cleaner production practices, and to sustaining commitments and implementation (e.g. supporting and multiplying cleaner production centres, incorporating cleaner production in university curricula), financing, and building of partnerships.

It is hoped that this programme will help countries to leapfrog technology and policy and institution-building approaches which took the OECD countries three decades to develop in moving from command and control to cleaner production approaches.

North America

Ms N. Roy, Director, National Pollution Prevention Roundtable, USA, reviewed the Roundtable's history and provided an overview of the status of pollution prevention in the United States. The Roundtable was created in 1985 to share expertise on at-source pollution prevention. Members are officials of state, local and tribal governments, with affiliate members coming from business, NGOs, federal agencies and others. The Roundtable has grown substantially, now attracting more than 500 participants. An international working group has recently been created. It is looking to link with other Roundtables around the world, and has drafted an international pollution prevention proclamation calling for governments to commit more resources to pollution prevention. On-line discussion forums and topic-specific E-Mail are part of the Roundtable services.

Participant good news story: Egypt

At a Cleaner Production Conference in Paris in 1992, the Egyptian Minister of Industry stated that "industry is top priority, environment is the least priority". He has since left office and has established a private consulting firm on cleaner production. Cleaner production technical assistance is now being provided to industry, and waste minimization regional clubs have been established.

In the US as a whole, numerous efforts are being taken at a national level to reinvent the US system of environment legislation, attempting to be more multi-media and prevention based. Pollution prevention pilot projects and assistance programmes are growing across the US, although available resources have reached a plateau or are diminishing, making competition for funds intense. Pollution prevention positions are being phased out of high profile offices and being integrated elsewhere. Incentive programmes for industry, meanwhile, are on the increase. ISO 14000 is often mistakenly being promoted as an environmental panacea, while chemical use reporting continues to be contentious. A recently released draft US EPA study which surveyed a thousand small and large companies to find out what motivates industry to adopt a pollution prevention approach provides a number of clues to what does and doesn't work in promoting pollution prevention.

Asia and Pacific region

Mr C.M. Lin, Divisional Manager, Environmental Management Division, Hong Kong Productivity Council, provided a perspective from the world's most rapidly industrializing region. Rapid economic growth has led to increasingly pressing environmental problems. As a result, cleaner production has been given increasing attention in recent years and many countries have initiated a wide variety of cleaner production activities. Many of these are proving to be successful, but many bar-

The role of engineers

Chair: Prof. Dr Don Huisingh,
Huisingh Environmental Consultants, Inc., the Netherlands

Engineers play crucial roles in all phases of planning and implementation of cleaner production in companies. But current engineering practices are often focused on "end-of-pipe" pollution controls, and although cleaner production brings potentially huge benefits to industry, it is not yet sufficiently being promoted or integrated into the professional training of those capable of actually making cleaner production happen. This parallel session provided insight into the ways an academic institution, a world-wide, engineer's professional organisation, and an overseas volunteer management co-operation programme are addressing cleaner production challenges.

Mr G. Timcak, Head, Numerical Geology Section, Department of Geology and Mineralogy, Mining Faculty, Technical University of Kosice, Slovak Republic, provided an overview of cleaner production courses at his university and at other educational institutes in his country, including continuing education programmes for engineers in companies. An Institute of Lifelong Learning will also be incorporating environmental courses into senior citizens' education. Slovakian international commitments, legal requirements, industrial restructuring needs and rising environmental awareness are all expected to fuel increasing engineering interest in cleaner production.

Mr D. Thom, President, Committee on Engineering and Environment, World Federation of Engineering Organisation, outlined his organisation's efforts, in collaboration with UNEP and development agencies, to provide engineers with the ethics and tools needed to create a professional capacity for the creative application of knowledge and technology to achieve sustainable development. This includes the adoption of a Strategic Action Plan to develop a world-wide understanding and commitment to sustainable development, dissemination of the UNEP cleaner production newsletter to engineering institutions world-wide, regional and national centres and electronic information networks, and integrating sustainable development into education and research programmes.

Dr W. Zuidhof, Netherlands Management Co-operation Programme, outlined his organisation's "senior executive consultancy", which provides voluntary advisory and training services by retired experts and managers to requesting developing countries for up to three months at a time. The organisation puts an emphasis on cleaner production. A Memorandum of Understanding has been signed with UNEP IE to provide cleaner production activities in developing countries.

Workshop discussions identified the need to define the role of engineers as change agents and in the whole process of institutional and personal "capacity building". Additionally, participants explored how the role of engineers should change in the future to become facilitators of management and technological process changes within companies, so that cleaner production concepts are increasingly implemented in all companies throughout the world.

riers to the widespread adoption of cleaner production in the region still exist. These can be categorized as internal and external barriers. Internal barriers include lack of environmental management knowledge, lack of confidence in cleaner production relative to end-of-pipe technologies which do not affect production if something goes wrong, lack of cleaner production technical support within factories, and difficulty in borrowing from banks for cleaner production investments. External barriers involve government and include: inconsistent policies, often geared towards end-of-pipe, weak enforcement of legislation, and lack of institutional support to help companies remove internal barriers.

Some important lessons can be drawn from the successful cleaner production experiences in the region. First, cleaner production programmes must be comprehensive, involving awareness/knowledge enhancement, demonstration projects, and consultancy support. Second, company leadership needs to be convinced for cleaner production to be adopted. And third, cleaner production specialists need to be trained in both technical and marketing aspects of cleaner production.

Mr Lin provided three recommendations to UNEP to support the acceleration of the adoption of cleaner production in the region:

- Promote networking, partnership and information sharing within the region;
- Assist in bench-marking what can be achieved;
- Further strengthen cleaner production capacity building in the region and help find mechanisms to make regional cleaner production initiatives sustainable.

Innovation for sustainable production and consumption

Chair: Nicholas Hanley, Policy Assistant, Directorate General XI, European Union

Applied to products and services, the cleaner production concept provides an innovative potential that goes well beyond its evolutionary improvements to production processes. And it is clear that more than incremental improvements will be needed to make global production and consumption patterns environmentally sustainable. Otherwise, incremental improvements are likely to be overtaken by the sheer scale or growth of consumption. This session provided a closer look at how a sister concept to cleaner production, Factor 10, could provide a vision needed to spur such innovation, and how a hardware and retailing company and business in general are responding to the innovative challenges of sustainable production and consumption.

Factor 10

Prof. F. Schmidt-Bleek, Vice-President, Wuppertal Institute for Climate, Environment and Energy, Germany, pointed out that we are currently unable to understand the complex nature of our ecosphere, economic and social systems or predict their complex interactions. In essence, humans are essentially a parasite on the ecosphere. If we are to

Mr James Clappison, United Kingdom Parliamentary Under Secretary of State at the Department of the Environment, welcoming delegates at the Oxford Seminar.

be a benign parasite, not overstretching ecosphere capacities (and become "fossil makers"), we need to treat natural resource productivity at least as seriously as we have treated labour and capital productivity in the past. There are essentially three ways in which we impact the ecosphere: 1) resource removal and material movements (e.g. irrigation); 2) emissions and effluent of defined toxins (eco-toxins); 3) extractive, production and product wastes. Current global consumption and production patterns need to be "de-materialized" by a factor of two to become environmentally sustainable. But if we want to have a world which is at peace, room needs to be made for the material development of developing countries. This means that western style processes, products, infrastructures and services need to be de-materialized by an average factor of 10. In 1994, the international Factor 10 Club was created to encourage the western world to sharply reduce its use and consumption of natural resources and to measure economic development in terms of human welfare rather than production volumes. Austria has recently adopted factor 10 as a state goal.

In conclusion, innovative, leaner approaches need to be applied to satisfy human needs. Ecological progress made in dematerializing or making products cleaner (e.g. eco-efficient cars) will be overwhelmed if the institutional consumption scales are not also dealt with. Longer-life, sustainable products will inevitably be more expensive than current products, so financing will become extremely important. Sustainability is also likely to require more labour, and pressing labour concerns, essential to human welfare, should not be overlooked.

From processes to products to services

Dr A. Knight, Quality and Environment Controller, B&Q, United Kingdom, reviewed how his hardware and retailing company is tackling the challenge of making its products environmentally sustainable. B&Q is the largest chain of home improvement retailers in Europe, selling over 40,000 products. It started to tackle environmental challenges when it found its market changing. Customers were increasingly demanding not only

Greening of development banks

Chair: Mr G. Jordfald, Project Manager, Norwegian Agency for Development Co-operation

Mr D. Prasek, Principal Environmental Specialist, Environmental Appraisal Unit, European Bank for Reconstruction and Development, provided the example of a bank which had been greened right from the beginning, with environment as part of its mandate when it was established in 1992. Although cleaner production was not a strong element of the Bank's lending in the beginning, procedures have recently been approved to encourage a more proactive approach to apply cleaner production to direct lending. Key barriers are the lack of proper skills among borrowers in preparing good business plans, and the difficulty for lenders in identifying good cleaner production projects with good business plans.

Mr A. G. Marcil, President and CEO, World Environment Centre, discussed the role and specifics of financing cleaner production. He identified the need for a culture change to bridge the gaps between banks and small industrial borrowers. Loan processes need to be simplified and made more transparent – if the process takes an indeterminate amount of time with uncertain results, than companies are less likely to submit cleaner production projects. Finally, he stressed that as cleaner production projects have good pay-backs, availability of credit is not the problem, but guarantees are needed to overcome risk averseness.

Discussions which followed provided these recommendations to UNEP to help promote the greening of finance:

- Assist in training banks and industrialists so they understand each other on cleaner production financing needs;
- Get someone seconded to UNEP from a bank to work with NCPCs to possibly assist in an advisory capacity to banks;
- Survey banks and evaluate good outreach materials.

quality products and good service, but also environmentally sound products, and were expecting the company to act in an environmentally sound way. Although it is difficult to measure or prove "environmentally sound", customers hold the company responsible for what it sells. And home improvement products, such as timber, paints, strippers etc., cause a lot of damage to the environment. The company began to investigate what harm its products were doing to the environment, starting with timber. Initially, 90 per cent of its suppliers could not tell B&Q where their timber came from, although half said it came from well managed forests. B&Q developed a policy that all its timber must come from well managed forests and set target dates to know, by the end of 1993, where its timber comes from and, by 1995, whether it comes from well managed forests. It has now achieved this for 91 per cent of its sources of timber. It then faced the issue of environmental labelling and concluded that true environmentally responsible retailing meant not handing over its environmental responsibility to customer choice. B&Q developed a certification scheme in collaboration with a well regarded, independent forest certification body, to win back the trust of a market which had grown cynical of manufacturers' environmental claims. Its goal is to have all its timber independently certified by 2000, with certification already occurring in ten countries. B&Q has also set policies and step-by-step targets to environmentally improve other products (e.g. paint solvents, brass door knobs, etc.). This has led to widespread public recognition and even endorsements from environmental groups.

This has all been accomplished without a formal environmental management system. B&Q believes that environmental management systems have a tendency of distracting a company's attention away from immediate environmental issues. And the lack of intellectual understanding and agreement behind EMS certification means that much effort is diverted and lost in academic debate. Environmental responsibility is about knowing how your products are made, and making improvements. 70 per cent of the problem can be solved by applying common sense. B&Q does not demand its suppliers to become certified as having a environmental management system in place. Instead, it works with suppliers who understand the life cycle environmental impacts of their products, and can demonstrate that they are doing something about them. When asked whether this meant a reduction in the company's supply base, particularly SMEs, Alan Knight acknowledged that there is a current trend of retailing companies reducing their supply base for a number of other, unrelated reasons. Not only has the environment had little to do with this overall trend, but it has sometimes even worked in reverse by providing new opportunities for environmentally sound small suppliers.

Mr C. Duff, Project Manager, World Business Council for Sustainable Development (WBCSD), then provided the perspective of a global environmental organization of 124 international companies committed to the environment and principles of economic growth and sustainable development, coming from 33 countries and 20 major industrial sectors. It has a number of policy working groups working on such issues as trade and environment, sustainable production and consumption, business and climate change, sustainable forests, financial markets, and central and East Europe. The role of business in making production and consumption sustainable is to generate products and deliver services that bolster economic growth while minimizing environmental consequences. Business can best work towards these goals by applying eco-efficiency principles, addressing the life cycle of goods and services, procuring products and services with reduced environmental impacts, and making accurate environment information available to customers and the public. He emphasized that companies will find more value for money in taking a more holistic view which looks beyond micro improvements to production processes. The WBCSD has produced a book of case histories on sustainable production and consumption to spread the message on what can be achieved by business.

Cleaner production education and training

Chair: Prof. Dr Huisingh, Co-Chair of the UNEP Cleaner Production Working Group on Education
Rapporteur: Mr Michael Sogaard Jorgensen, Technical University of Denmark

Mr Wang Ji, Deputy Chief, National Environmental Protection Agency, China, presented the experiences of cleaner production training in China, which has focused on "training of the trainers" from research and development institutes and provincial Environmental Protection Bureaus to obtain a fast multiplication of the training activities, and on training of company technicians. An important barrier is the lack of funding in China for training programmes on cleaner production. Vladimir Dobes, Director, National Cleaner Production Centre, Czech Republic, presented Czech experiences with education and training on cleaner production. The target groups have been industry, government and universities. It was found that top management usually does not have enough time for participation in such training programmes and governmental officials are sometimes closed to new concepts like cleaner production.

The subsequent discussion focused on the experiences with cleaner production training within different target groups. Experiences were reported with training of company management and employees, trade unions, school children, governmental officials, and university staff and students. Regional training centres have been established as part of the Basle convention on hazardous chemicals. Cleaner production has been highlighted as an important measure to help implement the Basle convention.

It is important to focus on the whole organisation in training programmes tailor-made for companies and combine top-down and bottom-up activities. Company staff that present their experience with implementing cleaner production can be useful input to training courses for staff from other companies. Trade unions in some industrialised countries have developed some interest in cleaner production, while trade unions in Central and Eastern European countries are more hesitant. Attention to occupational health and safety issues motivate shop floor employees and trade unions in the industrialised countries to take an active part in implementing cleaner production.

Lack of time prevents training of governmental officials in some countries. In Mexico, training has been performed in the morning at the employees' workplace. The participants receive a certificate for their training. The training of governmental officials should include training on team building and problem solving.

Training of school children is a part of some Indian community activities on environment. School children assess the environmental effect of cleaner production in companies through monitoring of the local environment and reporting back to the school, the companies and the authorities.

Different strategies have been used worldwide to integrate cleaner production in university curricula, from single lectures in existing environmental course modules to development of new masters and PhD programmes. Students and university staff have gained practical experience at many universities by assisting companies in cleaner production activities.

An international inventory on cleaner production education and training programmes has been complied by the UNEP Cleaner Production working group on education and published by the Finnish Association of Graduated Engineers, TEK. For further information, contact TEK or the UNEP working group.

Instruments for promoting cleaner production

Chair: Prof. Z. Nowak, Director, NIF-NOT, Cleaner Production Centre, Poland

While cleaner production projects have successfully spread to many countries, and participating companies have proved ready to adopt at least the easiest cleaner production options, the multiplying effect within companies and to companies outside the project is not automatic. Case studies, in-plant demonstrations, and training on their own will not ensure that cleaner production becomes a way of life for companies. External forces or mechanisms need to

consistently reinforce companies' cleaner production strategies. This session looked at the extent to which government permits, voluntary environmental management standards (ISO 14000, BS 7750, EU Eco Management and Audit Scheme), and large companies' procurement processes could complement and reinforce the adoption of cleaner production.

Government permits

Mr R. Glaser, Public Health Officer, Inspector of the Environment, International Affairs, Ministry of Housing, Spatial Planning and the Environment, Netherlands, addressed the question of using government permits to incorporate cleaner production in company operations. A permit is a contract between the operator and the authority providing the permit. A permit must contain clear, enforceable conditions, such as quantifiable emissions, safety measures, monitoring and reporting obligations, etc. which will stand up in court in the event of persistent non-compliance by the permittee. To determine the level of environmental performance required of a company receiving a permit, government authorities consider a range of criteria such as best practical means, best available technology (BAT, best available technology not entailing excessive costs (BATNEEC), best available control technology (BACT), environmental management systems, ecomanagement and audit scheme (EMAS), etc. But government authorities often have a difficult time determining what these concepts mean in practice. And industry, which usually has a much better understanding of industrial processes, often prefer technologies that are CATNIP (cost avoiding technology not involving prosecution) or BATNEAC (best available technology not entailing any cost). This makes best available technology concepts difficult to enforce in practice. And authorities cannot prescribe cleaner technology to be used in permits, because they are blamed when it doesn't work or when something goes wrong. Only the level of emissions or environmental impact can be prescribed and enforced. Cleaner production, by definition a process of continuous improvement, means changing minds first, and then finding ways to implement it. Thus, cleaner production is difficult to incorporate into permit requirements, and even more difficult to enforce.

Government authorities must rely on a combination of other measures to promote cleaner production among the regulated community. These include soft measures such as promotion and information strategies, subsidies for demonstration projects, appeals to industry responsibility, voluntary agreements with target groups, promoting voluntary schemes like ISO 14000 and EMAS, and considering a company's adherence to such voluntary schemes as a part of the permit process. Such soft or carrot measures need to be combined with a hard or stick approach such as: taxes, levies and recycling of funds, emission standards, compulsory EMAS, permitting with EMS, exclusive production methods. Government authorities need to find the right mix of tools most appropriate to their country's and industry's situation.

Biotechnology for cleaner production

Chair: Prof. C.E. Rolz, Co-ordinator and Principal Scientist, ICAITI, Guatemala

This parallel session provided an opportunity for the UNEP Working Group on Biotechnology for Cleaner Production to review its work and identify future issues and needs. Biotechnology is defined as the systematic use of micro-organisms, plant or animal cells and enzymes for industrial application. Biotechnology already provides an important contribution to reduce the environmental burden through end-of-pipe applications (e.g. aerobic and anaerobic water or waste treatment, bio-filtration of air and bio-remediation of soil). The application of biotechnology for cleaner production offers even greater promise in achieving sustainable development.

The UNEP Working Group on Biotechnology for Cleaner Production has organised and supported several activities to identify possibilities in this area. Case studies have been identified for applications of cleaner production biotechnology in agriculture (e.g. addition of enzymes in cattle feed to reduce the amount of minerals in manure), textiles (e.g. use of enzymes for bio-stonewashing of jeans), leather and tanning industry (e.g. degreasing hides with use of enzymes), food industry (e.g. use of enzymes for production of instant coffee to reduce energy needs), metal products (e.g. recycling degreasing agents through a bio-reactor), chemical industry (e.g. production of fine chemicals in bioreactors), pharmaceutical industry (e.g. production of pharmaceutical chemicals such as antibiotics in bioreactors), and pulp and paper (e.g. biopulping or biobleaching with the help of enzymes).

There are numerous possibilities for future applications of biotechnology for cleaner production in these and other industry sectors. A key issue to be resolved is whether the working group should consider cleaner production opportunities for genetically modified organisms. Several areas of need were identified. There is a need to train cleaner production engineers who don't yet understand biotechnology and its cleaner production applications. There is a need to spread understanding of biotech to NCPCs and academic institutions. Proposals for future work include providing an input into cleaner production training courses on biotechnology contributions, and organising demonstration projects to illustrate cleaner production applications of biotechnology.

ISO environmental management standards

Dr C. Bunyagidj, Director, Business and Environment, Thailand Environment Institute, Thailand, looked at the application and relationship of cleaner production and ISO 14001 Environmental Management Systems (EMS) standard in a rapidly growing Asian economy, characterized by small and medium enterprises. Cleaner production programmes initiated in Thailand have had moderate to high success in promoting the adoption of cleaner production in participating Thai companies. But these have often been one-time improvements rather than a continuous process, and the long-term sustainability of cleaner production programmes, currently financed by donor organizations, is questioned. The ISO EMS standard describes the general principles to be used to develop, implement, review and improve an environmental management system and supports pollution prevention activities. Both the cleaner production and ISO approaches are an alternative to traditional command and control approaches. Both require audits to determine environmental impacts and corrective options. And although cleaner production is a broader approach, the ISO standard provides a more formalized framework to institutionalize continuous improvement which requires management review and independent certification. The ISO standard also provides a more direct incentive and competitive self-interest to exporting Thai companies which will facilitate the uptake of the environmental management systems.

Thus promotion of cleaner production as an integral part of the ISO 14000 EMS standards is likely to yield a higher rate of adoption of cleaner production principles by a wider range of Thai industry.

Participant good news story: Consulting Engineers

Implementation of environmental management systems is helping to initiate and sustain cleaner production The International Federation of Engineering Consultants (FIDIC) joined forces with UNEP and ICC to develop the Environmental Management Systems Training Resource Kit, released in December 1995. The kit was recently translated into Spanish. Training based on the kit was received with great enthusiasm in Rumania, India, Taiwan and Colombia by government, industry, universities and consultants.

Supply chain management and procurement

Ms E. Prentis, Manager, Environment, UK and Europe, Nortel, described how a Canadian multinational telecommunications company started incorporating environment into its supply chain management and procurement. The first stage was learning how the company's operations impact on the environment. The company now sees environment as a business opportunity. It dis-

covered a business opportunity in redesigning the process of integrated circuit boards to phase out CFCs – in three years, the investment was paid back four times over. And in redesigning its packaging process, rather than investing in a break-even recycling scheme, the company reduced costs and made quality, efficiency and safety improvements. It is now trying to design out toxic materials in phones and switching equipment.

The same business opportunity approach is used in the company's supply management. It does not use environment questionnaires or ranking systems to rate its suppliers. It considers its suppliers as part of the team, and works with those who are responsive and flexible. This helps in developing mutual understanding, which is critical as environment is applied beyond processes to products and services. Government legislation is a very important driving force for industry. But customer needs and wants are an even more influential motivating force. Consequently it is also important to influence retailer and service industries.

Cleaner Production Working Groups

Chair: Prof. Ken Geiser, Director, Massachusetts Toxics Use Reduction Institute, USA, and member of the Cleaner Production Programme core programme

International working groups of experts in specific industry sectors or cross sectors have been one of the cornerstones of the Cleaner Production Programme since its beginning. Their original role was to identify good cleaner production case studies, a worldwide network of contacts, and a bibliography of relevant literature to be disseminated worldwide through ICPIC, and to provide expertise for training workshops. The working groups are now in a phase of reviewing their role to meet the evolving needs of the cleaner production programme, moving from information collection and dissemination to institutional capacity building and meeting other needs of cleaner production (e.g. cleaner product design, consumption). The working groups represent a broad pool of technical and substantive expertise, tying cleaner production concepts and management tools into practical applications in the real life of real companies. There are nine formal UNEP IE cleaner production working groups: leather tanning, metal finishing, textiles, pulp and paper, biotechnology, food processing, education, sustainable product development, and policies, strategies and instruments. Three of them – textiles, biotechnology, and sustainable product development – illustrated the richness and diversity of the working groups with plenary presentations.

Textiles

Prof. P. Modak, Chairman of the Cleaner Production Working Group on Textiles, provided a case history of one of the earliest working groups. It was established in 1991 in association with the Centre for Environment Science and Engineering at the Indian Institute of Technology, Bombay. Over a period of four years, UNEP IE provided the working group with a total of $18,000. Its mandate was to:

- build a list of contacts who might be interested in contributing or receiving information in a particular sector;
- collect concrete examples of how cleaner production could be applied to the textiles sector and review them;
- compile and share technical literature, norms, data etc. which others may not be aware of;
- publish newsletters to disseminate the information.

Various strategies were used to develop working group memberships and a network of contacts. Correspondence was circulated to key professionals and more than 40 textile research associations. In practice, only a few working group members were active. Many others provided only a one-time contact, and research associations showed little interest at the time because cleaner production was not high on their agenda. Still, more than 50 case studies collected by the working group were inputted to a diskette database, with the best 12 inputted to ICPIC. A bibliographic reference database was also compiled, along with a documentation of the best environmental practices in the textile sector. Two training programmes were held in 1993 and 1994, and the working group also participated in the training of 80 Thai textiles professionals. Three newsletters of four to eight pages were produced with a print run of 1000, the last issue with funding from industry.

With its original task completed and awareness of cleaner production much more widespread, the

Cooperation between the US National Pollution Prevention Roundtable and UNEP IE on International Pollution Prevention (P2)/Cleaner Production declaration

UNEP IE welcomes the initiative from the US National Pollution Prevention Roundtable to develop a Pollution Prevention (P2)/Cleaner Production declaration. The US Roundtable's draft declaration calls for the endorsement of four basic principles:

1. the increasing need to protect the environment and to develop a comprehensive approach that focuses on source reduction;
2. the need for international cooperation and agreement to target pollution at its source;
3. the need for a holistic approach or multi-media effort to address environmental issues;
4. the need to dramatically increase resources to pollution prevention and cleaner production efforts.

A number of participants at the Fourth High Level Seminar in Oxford voiced support for the draft declaration presented and circulated during the meeting.

It was agreed to work further with the US Roundtable on developing an International Pollution Prevention (P2)/Cleaner Production declaration.

UNEP cleaner production working groups: mission and tasks

Mission:

The mission of the UNEP cleaner production working groups (WGs) is to identify and supply technical expertise, advice and information in support of the UNEP Programme for Sustainable Production and Consumption, based on the strategy of cleaner production (CP) and the participation of specialised global networks.

Operating principles:

The WG activities are coordinated by UNEP IE. The WGs operate in a cooperative and complementary manner with other suppliers to the UNEP CP Programme, as a primary focal point in specific industrial, education and policy sectors. They utilise networking within the WGs as well as between the WGs, and via the groups to disseminate CP information to the global community. They provide technical and policy advice and information to industry, governments and other organisations on the promotion and implementation of CP.

Specific tasks include:

- offer services to CP centres (including UNEP/UNIDO NCPCs) and other related environmental organisations;
- communicate regularly between and within WGs, and internationally via newsletters, the Internet (E-mail and discussion groups). UNEP will make efforts to provide a listserver;
- hold an annual meeting (minimum) of WG chairs to coincide with the NCPC directors' meetings where possible;
- utilise the principles of benchmarking in the identification, assessment, research and development, and dissemination of information on products, processes, consumption and services and in relation to associated education and strategic development.
- continue with identification, assessment and compilation of good case studies and examples.
  - expansion of membership and participation;
  - training seminars and demonstration projects;
  - development of education/training materials.
- formalise a coordinated approach for external funding for individual WGs in total cooperation with UNEP IE, while continuing to seek funding for individual WGs from diverse sources.

Participant good news story: Denmark SME

You can plan to be cleaner even after your death. A small company in Denmark – only seven employees – was one of the first to be EMAS certified. It makes coffins. Today it uses use only water based paint, half the amount of paint, and half the amount of energy.

textiles working group is currently dormant. The need for further funding, which could come from other sources than UNEP, depends on the future role of the working group, which needs to be reviewed in the context of cleaner production progress and future needs. Internet chat forums could provide one possible window of opportunity which could be explored.

Biotechnology

Bas Kothius, Secretary of the Biotechnology for Cleaner Production Working Group, described this working group's activities. It was also established in 1991, with funding from the Dutch Government. Its main objective was to establish the concept of biotechnology as a tool for cleaner production at a time when only end-of-pipe applications of biotechnology were being envisioned (e.g. waste water treatment). An active group of ten experts from industry, universities, research institutes, government, and UNEP from ten countries provides the main impetus to the working group, with a broader network of 50 experts. Its main tasks are identifying case studies of cleaner production applications of biotechnology. These can fall into four main forms of industrial applications:

- biotech installations (fermentors, reactors) in industry processes,
- application of bio-catalysts (enzymes) in industry processes,
- application of biotechnology produced substances in materials or as part of products(citric acid in food, bio-plastics),
- application of biotech products (bio-pesticides, bio-fertilizers).

Case studies are being collected for application to the following industry sectors: mining, textile, food, leather, fisheries, pulp and paper, metal finishing, chemical and pharmaceutical industries.

Other activities of the working group include responding to queries received by the UNEP IE office, referring to specific experts, general networking and co-ordination, hosting and participating in international conferences.

Sustainable product development

Dr J.C. van Weenen, Chairman, Cleaner Production Working Group on Sustainable Product

Greening of the service industries: tourism

Chair: Mr A.J. Blaza, Chairman of the BSI Environment Certification Advisory Council, UK

Tourism is one of the world's most important service industries and one of the most dynamic. Increased growth is expected over the coming years, with an average 6-8 per cent growth in investment to the year 2005. It is also one of the most important sectors in terms of investments in new facilities, plants and equipment. World hotel capacity alone has increased by more than 25 per cent in the last decade. Tourism (transport, accommodation, catering and leisure) is a huge consumer of natural resources (land and ecologically sensitive areas), water and energy. Tourism also produces solid and liquid waste and emissions. There is thus ample scope for the application of the concept of cleaner production in the tourism industry, particularly as tourism often depends on local environmental quality.

Ms R. Lichtberger, Environmental Co-ordinator, Hotel Inter-Continental, Zagreb, Croatia, Mr R. Nafti, Director, Cleaner Production Centre, Tunisia, Ms W. Tuxworth-Twist, Director, International Hotels Environment Initiative, and Mr D. Sisman, Director, Environment, World Tourism Council, provided case studies illustrating the needs and some existing initiatives in promoting cleaner production in the tourism industry.

There was widespread consensus in the discussions which followed. Participants agreed on the importance of the tourism industry. The question is no longer should the cleaner production approach be promoted in tourism, but how, and what are the key needs? The key needs identified were information, education and communication in the tourism industry, particularly among SMEs, tourism students and other partners such as governments, local authorities and consumers. Information which needs to reach these key stakeholders includes the environmental impacts of tourism, good housekeeping services, technologies, environmental management tools, etc. It was recognised that the tourism industry is at different levels of environmental understanding and has different needs. The question which needs to be addressed is how to use the existing cleaner production network to promote the cleaner production approach within the tourism industry. It was noted that cleaner production is a difficult concept to sell because the tourism industry does not produce anything in the traditional sense. It was nonetheless proposed that a working group on cleaner production/tourism be established as a vehicle to shift the industry's focus to cleaner production, emphasising actions over study.

Innovative financing for promoting cleaner production

Chair: Ms H. Thompson, Head, Environmental Management Unit, National Westminister Bank, UK

The lack of financing for cleaner production investments is often cited as a key barrier to the adoption of cleaner production in spite of its favourable financial returns and short payback periods. Often the amount of financing needed is too small to be of interest to existing loan and investment institutions. How can these and other financial barriers be overcome and how can UNEP help?

Mr Duan Ning, Coordinator of the National Cleaner Production Centre, China, articulated the dilemma and challenges facing China in obtaining financing for cleaner production. He cited the bias towards traditional pollution control and waste treatment over the smaller cleaner production market, and the reluctance of Chinese enterprises to invest in cleaner production despite obvious economic and environmental benefits. Government, development agencies, companies and banks were identified as key players in overcoming the financial barriers to cleaner production.

Mr F. Knecht, Vice-President, Environmental Management Services, Swiss Bank Corporation, Switzerland, provided a banking perspective. He emphasised the need to convince the financial community that it is in their own interest to loan and invest money in cleaner production. He translated the eco-efficiency principle into financial language by pointing out that maximising material intensity meant increased profits, minimising energy resources meant reducing costs, minimising toxic dispersion translated into decreased liability, enhanced material recyclability meant cost-efficient closed loops, maximising renewable resource use provided a long-term strategic advantage, and extended product durability meant satisfying consumer demand. He concluded that it is in the bank's liability and competitive interests to take cleaner production seriously, that companies which understand and manage eco-efficiency well will be able to get credit faster, and that those who don't will have more difficult times.

Discussions which followed identified a role for development banks and governments to close the gap between the sophisticated financial market and the special needs of SMEs, that small investments which are too costly for existing institutions to handle may require some combination of revolving funds or government guarantees, that some credit lines are not used due to lack of skills among those writing proposals, and that banks usually lack skills to evaluate environmental liability. It was suggested that the NCPCs could play an advisory/assessment role to local banks, and that UNEP IE convene a meeting with financial institutions and development banks to develop their role in closing the cleaner production financial gap.

Development, provided details of a third cleaner production working group. Its goals are to explore, develop and implement the concept of sustainable product development (SPD) worldwide. SPD concerns the present and future relationship between:

- elementary human needs, especially of people in developing countries;
- required functions of (alternative) products, services, systems;
- availability of resources and energy as well as their holistic and specific characteristics;
- human influence upon the environment.

To date, the working group has focused on human needs in terms of communication, use of water, cooling, heating, textiles, transport, and cooking. Different product design approaches are considered, including: renewable materials, energy efficiency, optimized design, de-materialization, life cycle design, longevity, strategic design, services, and positive elements for SPD.

The working group's network currently consists of more than 600 members in 55 countries. Networking activities include information collection and dissemination, workshops, brokerage meetings, and establishing expert groups. An expert group on renewable resources has recently been formed. Databases of SPD product examples and research contacts have been established. A magazine, "Way Beyond", is published regularly along with research reports, newsletters, news faxes and scientific articles. The working group also has a World Wide Web home page (http://unep.frw.uva.nl/) which is linked to several international and Dutch Internet sites.

Beyond demonstration

As the Cleaner Production Programme's information collection and dissemination activities first began to reach different corners of the world, many already began to express the need for demonstrations of how cleaner production could be applied in practice. And no sooner had demonstration projects been piloted in different industry sectors in different countries, than the need to go beyond demonstration projects to build local institutional capacity was increasingly voiced. The UNEP Cleaner Production Programme has had to quickly adapt to these shifting frontiers in promoting cleaner production worldwide, while still expanding and deepening its original information collection and dissemination activities. Two models of moving beyond demonstration have so far been trialled by the Cleaner Production Programme: the joint NEPA/UNEP/World Bank Cleaner Production Programme in China, and the joint UNEP/UNIDO National Cleaner Production Centres.

The NEPA/UNEP/World Bank Cleaner Production Project in China

Mr Wu Baozhong, Director General, Department of Pollution Control, National Environmental Protection Agency (NEPA), and Mr Sybren de Hoo, Senior Consultant, UNEP IE Cleaner Production Programme, provided a summary of the activities and lessons learnt from the joint UNEP, World Bank and NEPA project to implement cleaner production in China from 1993 to 1996.

NEPA adopted cleaner production as China's basic approach towards sustainable industrial development at a national conference in 1993. NEPA's promotion of cleaner production was initiated with a loan from the World Bank and with support of the UNEP IE Cleaner Production Programme. The project provides a model to develop cleaner production in a country. The model used depends on five inter-related aspects:

1) Developing a cleaner production vision, starting small and thinking big.
2) Making cleaner production the first environmental priority.
3) Modifying environmental and industrial policies.
4) Implementing a demonstration programme and infrastructure.
5) Providing (long-term) financing and assistance.

The project in China included:

- pilot work in 27 companies different in nature, scale and industry sector, involving 30 full cleaner production audits which identified pollution reductions of 30-40 per cent;
- training of 150 professionals in cleaner production auditing;
- creation of the Chinese National Cleaner Production Centre and a network of Chinese institutions dealing with cleaner production;
- several Chinese cleaner production manuals;
- five cleaner production related policy studies conducted by Chinese researchers.

Common lessons learnt by the 27 companies which took part in the project are:

- Most of the cleaner production options identified are economically profitable.
- Management skills have improved through the implementation of low cost options.
- Cleaner production is beneficial not only for their image but also for competitiveness of their products.

Problems encountered during the project included:

- the continuous dumping of new concepts;

International Cleaner Production Information Clearinghouse (ICPIC)

Evaluation of diskette version

One of the recommendations of the Warsaw Third High Level Cleaner Production Seminar was to make ICPIC information more widely accessible by producing a diskette version. UNEP IE has since produced a first version of a diskette, providing cleaner production examples of successful government and company policies and strategies, technical case studies, publication abstracts, and listings of contacts and institutions. Users were asked what they thought of the diskette, to help improve future, updated versions. Four hundred seventy evaluation forms were sent out with a 15 per cent return rate from cleaner production centres, governments, academic institutions, consultants, non-governmental organisations and industry in 36 countries (14 OECD and 22 non-OECD). Summary results are as follows:

Usefulness

- 96 per cent found at least half the content of the diskette of technical and substantive value.
- 99 per cent found at least half the content relevant to their work.
- 81 per cent found at least half the content new.
- 84 per cent said that at least half the information will be of use to them

Quality

- 98 per cent felt the objectivity of the information is very good or adequate.
- 95 per cent felt subject coverage is very good or adequate.
- 82 per cent felt the timeliness of the information is very good or adequate.
- 79 per cent felt the presentation is very good or adequate.

Application

- 100 per cent requested future updates of the diskette.

Uses of the diskette included: research to develop respondents' own cleaner production programmes and clearinghouses, contributions to presentations, training programmes, publications and promotional materials, resource for cleaner production hot-lines, client query response services.

- 81 per cent felt the first or second best use of the diskettes is as a reference tool.
- 98 per cent indicated they would be sharing the use of the information, and 84 per cent will be providing it to five or more people.

Comments on how to improve the diskette

- Develop Windows and CD-ROM versions.
- Improve printing options.
- Connect via Internet WWW.
- Improve demonstration version.
- Provide hard copy of the information (as a complement).
- Highlight new information in each version.
- Add entries in foreign languages.
- Make searching easier: improve key words, divide case studies by industry sector, create ability to search all databases at same time (cross reference all databases), provide hard copy user guide/keywords.
- Additional information: more of everything, Internet site addresses, computer software, checklists, manual on cleaner production auditing, process analysis, cost accounting, risk ranking.
- Additional topics: employee involvement, SMEs, transport, wine, cabinetmaking, schools, service industries, hotels, department stores, offices, banks and insurance.

Inter-agency cooperation for cleaner production

Chair: Mrs Joke Waller-Hunter, Director, Division for Sustainable Development, United Nations Department for Policy Coordination and Sustainable Development

The UN and other intergovernmental organisations participating in the seminar arrived early to take the opportunity to exchange information and to identify further areas of cooperation in promoting cleaner production and sustainable development. Mrs Joke Waller-Hunter, Director, Division for Sustainable Development, United Nations Department for Policy Coordination and Sustainable Development, which provides secretariat services to the Commission on Sustainable Development (CSD), chaired the meeting, which was attended by the World Bank, United Nations Development Programme (UNDP), United Nations Industrial Development Organisation (UNIDO), Organisation for Economic Cooperation and Development (OECD), the Asia Productivity Organisation (APO), and UNEP IE and the UNEP Regional Office for Latin America and the Caribbean. The pre-seminar meeting enabled representatives to learn from one another's experiences, and to learn how they can assist each other and cooperate in the future promotion of cleaner production.

An update on CSD activities since the 1992 Earth Summit Agenda was first provided. A special session of the General Assembly will be held in 1997 to review the implementation of Agenda 21, the Rio Principles and the Climate Change Convention five years after the Earth Summit. Emerging priority areas for 1997 include the need to shift from understanding concepts to actual implementation of Agenda 21, and the need to focus on economic sectors such as industry, energy, transport, agriculture, etc. The last session of the CSD in April 1996 highlighted the need to focus more on sustainable consumption and the demand side, the need for support of developing countries' access to environmentally sound technology, and the need for the developed world to avoid trade barriers that place restrictions on developing countries. The CSD work programme on sustainable consumption includes: 1) identifying long-term social economic trends, with a first report being prepared in cooperation with UNEP for 1997; 2) the impact of sustainable consumption on developing countries (e.g. reduced natural resource demand, unintentional trade barriers from increased product process standards); 3) the appropriate policy mix to bring about change in consumption patterns; 4) broadening guidelines on consumer protection to include sustainable consumption patterns. On the supply side, the CSD work programme includes: 1) how to bring about technology change for sustainable development, using eco-efficiency as a guiding principle; 2) improving access and dissemination of information of environmentally sound technologies; 3) supporting institution-building efforts for cleaner production; 4) strengthening partnerships. A review of work being carried out on energy is also in progress.

Participants provided information on some of the cleaner production related activities of their organisations.

UNIDO now has a close working relationship with UNEP in promoting cleaner production through the joint UNEP/UNDIO National Cleaner Production Centre Programme (see elsewhere in report for information on the NCPC programme).

UNDP provided an update on its Public/Private Partnerships Programme, which has recently been redesigned. Its objective is to start partnerships between the private and public sector in areas such as water management, waste management, reduction of air pollution and energy, etc. The ultimate goal is to create partnerships with a focus on urban environment. A project development facility, which will conduct feasibility studies and administer funds, is now being established. Cleaner production will be a key objective, and cooperation with other agencies is welcome.

APO provided information on the environment conference it is organising in Manila in December, involving a variety of economic sectors and stakeholders such as government, industry, labour, academics, consumers and NGOs. APO is financed by its 18 member countries' contributions, based on GDP. Its special environment fund received US$ 1.5 million dollars in 1994. A pilot demonstration project is underway in four factories to show small and medium-sized industries how cleaner production can be used. Other such projects will follow.

UNEP's Regional Office for Latin America and the Caribbean facilitates UNEP's technical programmes to reach the countries in the region. Most cleaner production initiatives in the region are externally catalysed. The UNEP/UNIDO NCPC programme has stimulated a lot of interest from countries looking to create their own centre and for UN funding opportunities. Cooperation with regional or national offices of UNDP and other UN agencies is made difficult by a lack of knowledge on what each party is doing, compounded by different institutional structures (e.g. UNDP has national offices which report to HQ in New York, with no regional structure comparable to UNEP's).

The OECD has completed its three-year programme on Tech and Environment, which included government policies for cleaner production, integrating cleaner production in sector policies (agriculture, energy, transport, manufacturing), practices and policies to foster transfer of tech and information, education and LCA. A new phase now focuses on sustainable product policies and life cycle management. A programme on sustainable consumption has made headway in clarifying concepts, and is now looking at key trends and at policy options and tools to change consumption patterns. Other areas of work include environmental performance of governments and of the OECD itself.

Key conclusions of the discussions were:

- There is a common understanding and objective of cleaner production, but there is still a long way to go to achieve its world-wide implementation.
- A lot of work has been done on data sharing, but much still remains to be done to make it known and more accessible.
- The challenge of reaching small and medium enterprises and internally generating demand for cleaner production is still unmet.
- Some activities are underway to help countries develop the kind of management capacity and knowledge necessary to qualify for ISO 14000 standards, but more is needed.

Public/private partnerships are important in promoting cleaner production and need to be looked into.

While cooperation among intergovernmental agencies in cleaner production-related efforts has improved greatly over the last few years, ways still need to be found to concretely improve cooperation among national and regional offices.

- lack of coordination of bilateral projects, methodologies and approaches;
- expanding cleaner production audits and processes to products and services.

Additional lessons learnt are:

- the need for reference and locally adapted materials (manuals, examples, database, etc.) to demonstrate what happens and to find alternative processes you are not familiar with;
- the need to strategically choose partners to ensure the multiplication of cleaner production activities. In addition to NEPA, UNEP, and the World Bank, the project included the active involvement of several key Chinese government agencies, research institutes and industries, as well as outside support of multilateral and bilateral organizations and international industry;
- the need to also analyse and modify existing policy structures which may prove to barriers to the adoption of cleaner production;
- the need to bring financial resources closer to companies.

National Cleaner Production Centres (NCPC)

Surya Prakash Chandak, Director of the National Cleaner Production Centre in India, provided a presentation on behalf of the NCPCs. The NCPC programme is a joint UNIDO/UNEP initiative. Nine NCPCs have been established over the last two years in Brazil, China, Czech Republic, India, Mexico, Slovak Republic, Tanzania, Tunisia and Zimbabwe. Their role is to co-ordinate and catalyze cleaner production in

their countries through in-plant demonstrations, training, information dissemination and policy assessment.

Each NCPC is hosted by a local organization which provides the NCPC with office facilities and staff, excluding the Director. Each NCPC has an advisory board made up of representatives of that country's key policy and decision-makers in government, industry, education and research institutions and others. Each NCPC is linked to a foreign counterpart institution which provides necessary support, guidance, documents and other forms of professional support.

NCPC activities in just under two years, less for those established this year, are impressive. Almost 100 demonstration projects have been carried out in a diversity of sectors such as textiles, pulp and paper, breweries, electroplating, etc. Numerous training activities have been undertaken. The NCPCs have provided intensive training to approximately 400 trainees a year. The Chinese NCPC alone has organized more than 30 cleaner production audit training programmes with over 2000 trainees. Almost all NCPCs have published articles and made presentations at national and international workshops. And some NCPCs have provided cleaner production assistance to neighbouring countries. NCPC Brazil conducted two seminars in Uruguay. NCPC India has conducted CP audit training in Sri Lanka and conducted or initiated CP pulp and paper audits in Vietnam, Indonesia, Malaysia and Thailand.

The cost effectiveness of the NCPC activities is equally impressive. The average annual NCPC budget is US$ 60,000. The average cost per demonstration project is approximately US$ 900. Intensive training has been carried out at an average of US$ 225 per professional. Information dissemination costs average roughly $20 per direct beneficiary. As estimations include the cost of establishing the NCPC and preparing basic training materials, these costs are likely to come down in the future.

Consequently, NCPCs are a cost effective way of carrying out cleaner production demonstration projects, intensive training and information dissemination, although even the small funds required are beyond the tight budgets of developing countries. All NCPCs are examining ways to become financially self-sustaining in the coming years without jeopardising the essential but non-profitable general information dissemination activities.

NCPC recommendations for the way forward are:

1) For promoting the adoption of cleaner production:

- Formulate and insist on an explicit requirement of CP in all internationally funded/assisted industrial development and environment-related projects;
- Create international pressure to establish market based instruments which automatically favour and promote cleaner production.

2) For sustainability and enhanced effectiveness of NCPC:

- Continue and enhance current patterns of support for a period of five years;
- Recognize, develop and support NCPCs as the most appropriate focal points for the institutionalization of Environmental Management Systems for ISO 14000.

Ode to NCPCs
by S.P. Chandak

What do people think about Pollution Control?
Pretty Costly
Prevents Competition
Promotes Corruption – so many scams
Postpones Catastrophes
Now we talk of CP instead of PC
Cleaner Production
Common-sense Practices
Creative Pursuit
Commitment and Partnership
Trying to Catalyze Productivity
Climbing Profits
Now we have NCPCs
A Network of Cleaner Production Charters
Looking to become Nodes of Catalyzing Progress in Countries.

New horizons in sustainable production and consumption

Chair: Serge Klebnikoff, Director, Development, World Business Council for Sustainable Development

Sustainable production and consumption is a common goal for business, government and consumers. Governments need to establish appropriate policy and economic messages. Business can influence demand of products and services. It is clear that partnerships, like those fostered by UNEP/UNIDO National Cleaner Production Centres, are the way of moving forward the sustainable agenda. But it is important to remember that without business commitment and leadership, there is no horizon for sustainable production and consumption. Two business speakers from the Asian region demonstrated how sustainable production and consumption is good business in a rapidly industrializing region.

Mr U.K. Park, President, CEO, Samsung Petrochemical Co. Ltd, Korea, emphasized the need for east Asian countries to reject the "growth first, environment later" paradigm of development which industrialized countries have mistakenly followed. He categorized five stages in ecologically efficient corporate management. The first is categorized by indifference towards environmental deterioration, and the pursuit of unrestrained prosperity and maximum consumption. The second sees increasing public environmental awareness and government intervention to prevent further environmental deterioration. Most East Asian countries currently fall in this stage.In the third stage, leading corporations begin to take initiatives in environment protection, often to save or protect their public image, but also in recognition of benefits of eco-efficiency. Such companies (e.g. Samsung Petrochemicals) are still rare in east Asia. The fourth stage is characterized by eco-efficiency being incorporated into mainstream business decision-making. The fifth and final stage, where the environmental costs are internalized in management accounting systems, has yet to be achieved in any country.

Participant good news story: Croatia

The war is over and an Initiative Board has been formed to start up a cleaner production centre.

But the corporation sector is still the largest environmental offending sector in the region and the development priority is to raise consumption levels as close as possible to those currently enjoyed in the industrialized countries. Ways need to be found to help east Asian countries shift from the second to third or fourth stages if the universal quest for prosperity is not to put an end to the environment.

Mr Y. Yamada, Special Assistant to Secretary-General, Asian Productivity Organisation, described his organisation's efforts to spread environmentally sound production in the workplace throughout the region. APO is an intergovernmental organisation of 18 states in the Asia-Pacific region, which have 33 per cent of the world's population and contribute 24 per cent of world GDP. Its objective is to increase productivity for balanced socio-economic development through its role as think tank, catalyst, regional adviser, institution-builder, and information clearinghouse. The concept of productivity has been broadening to embrace all aspects that lead to improved quality of life. Customers expect to receive goods and services which are not only harmless to their health but also harmless to the environment, at the right price. APO has thus adopted the term "green productivity" to incorporate cleaner production into the productivity conceptual framework. In 1994, APO instituted a special programme for environment to promote and demonstrate green productivity among enterprises in the region. A world conference on green productivity is being organized in December in Manila to promote the findings of the programme, and to provide an unprecedented forum for discussion among international and national government officials, business management, engineers, unions, academia, mass media, and NGOs.

Mr Yamada drew several lessons from the organisation's efforts to disseminate green productivity in the region. Small and medium enterprises need priority attention, using profit and competitive interests as key driving forces to adopt cleaner production over an end-of-pipe approach. Consumers are the ones who suffer from environment degradation and need to understand and play a role in contributing to environment improvements. As global interdependence intensifies, international organizations play an increasingly important role in exchanging information and experience in step by step environment improvement.

What are the relationships between cleaner production and ISO 14001?

When ISO 14001 was adopted as a fully fledged international environmental management systems (EMS) standard in Brazil in June 1996, it unleashed a great deal of world-wide interest and activity, a new wave of corporate virtuosity, not to mention a similar share of cynicism. The concern is that ISO 14001 can too easily be seen as displacement activity concerned more with bureaucratic "benefits" than *real* improvements in environmental performance.

Some see ISO 14001, incorrectly, as a panacea to all our environmental indiscretions. This it will never be. But a useful vehicle in the promotion of real environmental performance improvement it has the potential to be. But will this really be realized?

Having certification (or "registration" in US parlance) to ISO 14001 provides no guarantees that more environmentally benign processes, products or services will result.[1] This was never the intention. What ISO 14001 does is improve the *probability* that a company – no matter what size or in what location – will do this, but there are certainly no guarantees. This is true of any EMS, whether defined by ISO 14001 or otherwise.

Further, it is perfectly feasible for an ISO 14001 certificated/registered company to see compliance as the principal requirement of the system. This hardly favours the innovative, proactive approach required for a shift to cleaner production strategies and meaningful environmental performance improvements *per se*.

A shift from curative, "end-of-pipe" to preventive, cleaner production strategies, on the other hand, invariably does provide *guarantees* that a shift to improved environmental performance will result. This shift to cleaner production is, therefore, a tactic to achieve the goal of sustainable development. In contrast, an environmental management system is a framework within which the goal of, *inter alia*, cleaner production can be promoted – but it is not an end in itself.

Cleaner production is not mentioned explicitly in the ISO 14001 international standard. Prevention of pollution is defined so broadly that it includes elements such as treatment and control mechanisms, which could be construed as counterproductive to achieving the goal of cleaner production (or real pollution prevention).

The cleaner production opportunities in EMS are two-fold. Firstly, full interpretation of the term "continual improvement". For the standard this is defined only as it relates to improvement of the management system as a vehicle to improve overall environmental performance.

For this reason the on-going work of ISO's technical committee's sub-committees 4 and 5 on Environmental Performance Evaluation (ISO 14031) and Life Cycle Assessment (ISO 14040) are now critical. The work of these committees is seen by many as the most important of all, if very much more problematic.

Secondly, a great deal depends on the evolving work of new accreditation bodies and what they will design in terms of certification criteria. Their understanding of the need to include a shift to preventative approaches will be critical.

The accreditation bodies have the opportunity to set demanding standards and interpretations of the ISO 14001 standard for local use. Proposals to set up accreditation peer review systems may encourage such developments in Europe. But will it happen elsewhere? Accreditation bodies have a critical opportunity to set the agenda and provide local interpretations within ISO 14001's guidelines. Unfortunately, some of their bodies fail to acquire personnel with formal environmental qualifications either on their boards or to advise them. The chances, therefore, are that the standards will be unambitious and will not realize their full potential as a vehicle to introduce a meaningful shift from end-of-pipe to cleaner production strategies. In most cases it is predictable that standards will initially focus on pollution control and gradually move to prevention, but this will be a slow process without continual prompting.

The unprecedented interest that has been shown in the ISO 14000 series is generated by many factors – the implications for trade (particularly international), and for remaining on procurement lists and in supply chains, not to mention the creation of potentially lucrative rewards anticipated in some quarters. For many in business the formalization of an environmental management system is regarded conversely and grudgingly as a necessary, but bureaucratic burden.

For those working in this area, the major challenge is to assist companies who achieve ISO 14001 to answer the question "So now what?". If the answer remains focused on certification and compliance ISO 14001 will have achieved very little. Directors of UNEP/UNIDO's National Centres for Cleaner Production are pioneers in a paradigm shift that is underway. It is inevitable, therefore, that some unease will be felt with other emerging initiatives – particularly when they receive such popular support so readily as ISO 14001 has generally experienced.

The most appropriate way to view the relationship between ISO 14001 and cleaner production is on a temporal basis. An EMS provides a "tool box" in which to hold all the techniques that have developed in recent years (Environmental Auditing, Environmental Impact Assessment, Corporate Reporting, etc.) and those still being refined (Life Cycle Assessment, Environmental Performance Evaluation, Full Cost Accounting, etc.). Cleaner production is a short-term goal, a significant contribution to the overall goal of sustainability. All the tools in the EMS box will help make this goal a reality.

Companies with ISO 14001 will have responded to the interests of some stakeholders (principally relating to trade) by developing an internationally recognized management system and demonstrating as much with a certificate. The critical task is, however, to serve a broader stakeholder interest by committing to cleaner production – and the cost savings, liability reductions and opportunities, not to mention the guaranteed environmental performance improvements, that will result.

UNEP and the Canadian International Institute for Sustainable Development have initiated a task group to draft performance indicators that can be developed within environmental management systems. Without these the value of EMS's as a self-regulatory tool will be continually questioned.

Meanwhile, the Global Environmental Management Initiative (original authors of the Environmental Self-Assessment Programme based on the International Chamber of Commerce's Business Charter for Sustainable Development) have developed a checklist/primer based on ISO 14001 to improve facility managers' understanding of the requirements and elements of the EMS outlined in ISO 14001 It is designed to allow for a rapid self-assessment of an organization to determine how closely existing management practices and procedures correspond to the elements of the standard.

UNEP, FIDIC and ICC are also continuously updating their resource training kit on EMS's, which continues to be a best seller. This kit, it should be noted, deals with EMS's *per se* and is not constrained by ISO 14001's formalized limitations. Further versions will make the inter-relationship between EMS and cleaner production more explicit.

1. A witticism doing the rounds during Technical Committee 207 negotiations related to the ISO 9000 Quality Standards; it is possible for an ISO 9000 certificated company manufacturing life jackets to make them out of concrete, yet still be certificated – or perhaps certified!

Conclusions and recommendations

Chairs: Mr H. Mattos de Lemos, Secretary of Environmental Affairs, Ministry of Environment, Water Resources and the Amazon, Brazil, and Ms J. Aloisi de Larderel, Director, UNEP IE

Mr Jon Hobbs, Co-ordinator, Cleaner Production Programme, UNEP IE, summarized participants' recommendations on the Programme's vision, strategy, and work programme as follows:

The goals of this conference were to evaluate the worldwide progress made in promoting cleaner production, assess the barriers, and review the UNEP IE Cleaner Production Programme's vision, objectives, strategy and work programme to meet future cleaner production needs.

There is no doubt that cleaner production has indeed come a long way in only six years. Many participants remarked on how much has been accomplished by such a small UNEP IE cleaner production team: there was no question that the UNEP IE cleaner production approach had already played a major role in the worldwide dissemination of Cleaner Production Programme and that its continuing support was needed by those seeking to institutionalize cleaner production in their countries. But, ironically, as cleaner production initiatives multiply worldwide it is still not yet common as the first priority option among government and industry decision-makers in spite of cleaner production's obvious environmental and economic benefits and its prominence throughout Agenda 21.

This is why the main message to UNEP was: ***Target key decision-makers, form strategic alliances to enhance the catalytic function of the Programme, and increase the demand side for cleaner production.***

More specifically, recommendations focused on:

1. The cleaner production strategy

Cleaner production is recognized as one of the most important strategies giving definition to sustainability. However, the audience is diverse and therefore it is necessary to develop the concept in association with other related, but subtly different initiatives and concepts (such as international environmental management systems standards and eco-efficiency), and their advocates. The term "cleaner production" also makes it difficult to communicate that the concept equally applies to consumption issues as well. However, failing to address the latter will tend to undermine the successes achieved on the production side. Above all else, markets and customers provide motivation for innovation in industry. Furthermore political and business leaders need to commit themselves to cleaner production.

This is why recommendations were for UNEP to focus on strategic issues that can be a driving force for cleaner production. These include:

- Develop an international declaration detailing explicit actions requiring public commitment.
- Integrate cleaner production into allied concepts such as continual improvement.
- Increase emphasis on the product/consumption side.
- Integrate services (particularly retail) more fully into the cleaner production programme.
- Build cleaner production into procurement and supply chain requirements.
- Provide more support to SMEs (emphasizing economic and environmental benefits – win-win strategy).
- Promote integration of cleaner production into all policy options tailored according to local circumstances and relevance (e.g. command and control, market mechanisms, self-regulation).
- Develop strategic alliances with the financial sector (e.g. workshops with commercial banks, local cooperative banks, development banks).
- Develop key performance indicators and develop best practice benchmarking for different industrial and service sectors.
- Promote public access to information to create a more active demand for cleaner production.
- Link health and safety issues to cleaner production and engage trade unions.

2. The Cleaner Production Work Programme

Working groups

UNEP IE has to raise its support to the working

Participants' evaluation of the Seminar

Summary of Questionnaire No. 1

Participants in the Fourth High Level Seminar on Cleaner Production were asked to evaluate the seminar.

Thirty-three replies were collected and analysed as follows.

The figures summarize the opinions of the participants on: 1) how the seminar met the objectives of the participants, and 2) how they would rate the overall organization and efficiency of the seminar.

Met objectives: (total 33)

	No	Little	Somewhat	Much	Very much
Number	0	3	6	21	3
%	0	9	18	64	9

Organization and efficiency: (total 33)

	No	Little	Somewhat	Much	Very much
Number	0	2	7	17	7
%	0	6	21	52	21

The main objective of the majority of the participants was networking and getting an update on cleaner production activities worldwide.

Many participants felt there was too little time for discussions after and between the presentations, especially in the parallel sessions. Some suggested a scheduled free afternoon to arrange meetings with other participants or for recreational activities. Also, it was mentioned that more provocative presentations in smaller groups would help to create more interesting discussions.

Others found that the seminar needed more input and participation from industries, especially SMEs, and it was suggested to let industry itself organize a session. Regional sessions were also suggested as well as sessions on the governmental role in promotion of cleaner production, on integration of cleaner production and environmental management systems, and on overall technical issues. Many participants asked for more innovative and foresighted presentations.

Almost all participants found that a two-year frequency for the High Level Seminar was necessary in order to keep the "cleaner production" concept going.

Summary of Questionnaire No. 2

Participants were asked to evaluate worldwide progress of cleaner production.

Thirty replies were collected and analyzed as follows:

The figures summarize the opinions of the participants on: 1) the worldwide progress of cleaner production in the last four years, and 2) the role played by UNEP in this respect.

Progress: (total 29)

	No	Little	Somewhat	Much	Very much
Number	0	2	15	10	2
%	0	7	52	34	7

UNEP's role: (total 30)

	No	Little	Somewhat	Much	Very much
Number	0	3	7	17	3
%	0	10	23	57	10

Many of the participants felt that industry is becoming more interested in cleaner production and that it is a question of time before more significant results will appear, although the process of implementation is still very slow in SMEs who believe less, if at all, in the cost-benefits of cleaner production. The importance of other actors such as the financial sector and consumer organizations in the dissemination of cleaner production was emphasized by many.

UNEP was evaluated to have a significant role in the progress of cleaner production, being the focal point for cleaner production awareness and training in many countries. In particular, UNEP's many publications as well as the NCPC Programme were assessed as being very helpful.

It was mentioned by many that UNEP should focus more on the political and strategic aspects, thereby putting pressure on the national governments to recognize and implement the "cleaner production" concept. Also, many participants stressed the need for better cooperation between UNEP activities and other regional activities, as well as for a reinforcement of UNEP's various working groups.

groups and capitalise on the currently under-used potential. In particular, it has to:
- Assist in raising funds;
- Assign UNEP Cleaner Production Programme manpower as focal point for the working groups;
- Facilitate networking between the working groups.

The UK Government offered funding to one of the sectoral working groups to develop a pilot bench-marking scheme in their industry sector in order to develop indicators to measure progress in achieving cleaner production.

National Cleaner Production Centres
The existing network of UNIDO/UNEP NCPCs has to be strengthened. The establishment of new NCPCs has to be supported, involving the network. Actions recommended are:
- Facilitate networking between the various centres;
- Provide training support;
- Encourage self-sustainability (e.g. promoting better links with the relevant authorities and the private sector);
- Develop institutional links between the cleaner production working groups and NCPCs;
- Information should be provided in other languages besides English. Develop inter-NCPC communications.

The UK Government also challenged all the NCPCs to develop, over the next six months, their own mission statement with clear quantifiable objectives and measurable performance indicators.

Information systems and dissemination
The need for building knowledge, develop information systems to assist business, government and consumers to make better informed decisions was reiterated. Focus on improving policy strategy input to business and government through ICPIC and other means was also stressed.
- Information should not only deal with technology but also include policy measures and strategies.
- Adapt information and training delivery mechanisms for specific audiences to ensure translation from ICPIC diskettes into the next appropriate language and mechanism.
- Information should be provided in other languages besides English.
- All formats including diskettes, hard copies and the World Wide Web should be provided.
- UNEP IE should facilitate the creation of cleaner production round tables similar to those in Europe and the US, in other parts of the world, with the aim of sharing up-to-date knowledge on the subject.

3. Finally participants urged UNEP to incorporate the conference recommendations in its preparation of its 1998/1999 programme of work to be submitted to the UNEP Governing Council.

The next High Level Seminar

The Colombian Government and the Korean Government both offered to host the next High Level Seminar or other cleaner production events in their countries. Other participants also offered to host targeted workshops. ◆

Note: this Summary Report was prepared by Clare Cocault who acted as rapporteur of the seminar

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Closing speech and challenges

by John Hobson

Director, Environment and Energy Market Innovation Division, Department of the Environment, 9/10, 2 Marsham Street, London SW1P 3EB, UK

This has been an important event on a vital subject. We in the UK have been delighted to have the privilege of hosting it. It has highlighted the importance of a process of seeking information on cleaner production, developing case studies, catalyzing action, and disseminating best practice.

When Mr Clappison spoke to you at the beginning of the Conference, he suggested two major goals. One was the need for a strong message to the UN Governing Council. The other was that the Conference should stimulate networking and closer contact between people who otherwise can all too easily get isolated.

It has been clear to me in my short stay at the Conference that there has been plenty of networking! I am sincerely pleased about that.

As to messages to the Council, you have just heard a summary by Jonathan Hobbs (Coordinator of the UNEP IE Cleaner Production) of his own conclusions of the outcome of the Conference. This seemed to me a very clear and focused set of conclusions and I congratulate him on it. It is important that governments hear these messages at political level at the Governing Council loud and clear. One questioner has already suggested that there might be a draft protocol on cleaner production. I am sure that Jacqueline Aloisi de Larderel (Director of UNEP IE) will have taken that thought on board and will discuss in the coming weeks whether and how best to take it forward.

Another questioner has raised the question of the balance between sustainable production and sustainable consumption. This conference is about **cleaner production**. But as other questioners have indicated, we ignore the consumer at our peril. We must ensure that the demand side of the market is fully represented in our thinking. I was also pleased to hear that the finance sector is interested in being involved in further discussions.

I would now like to issue two challenges to you, which follow up well on Jonathan Hobbs' summary of conclusions. One applies to the working groups, and the other to the centres.

First the working groups. We have heard a lot of talk about benchmarking. I agree that this is a vital area to develop. On the UK's behalf, I should like to propose that, through the good offices of our excellent Environmental Technology Best Practice Programme, we should facilitate a pilot benchmarking project on one specific part of one working group's work. I therefore challenge the five sectoral working groups to put their heads together, and collectively come up with a number of possible topics between them for such a pilot project from which we, with Jacqueline Aloisi de Larderel's help, can choose just one for development. I have asked Gareth Martin of the Best Practice Programme, who is here today, to act as coordinator for the pilot and he will be in touch with the working groups to get action moving.

Secondly, I am delighted to see nine heads of National Cleaner Production Centres here today. It is good to see that these centres are now up and running. But it is important to have systems in place to measure their progress and success. Have all the centres got clear missions, quantified targets, and measurable performance indicators? Is industry fully engaged? Are you involving the consumer community? Here is my second challenge – that each centre should ensure that within the next six months such targets are in place and are written down. I am giving each of you a small stone memento from Oxford to take away with you, which I hope you will keep on your desks to remind you of this challenge.

I am pleased this has been a successful event and I trust we will leave it with renewed enthusiasm. It needs repeating at regular intervals, and we have already had two offers (from Colombia and Korea) for hosting the event in 1998. I am sure Jacqueline Aloisi de Larderel will be considering those and any other offers that are received. I certainly think that it would be appropriate for the next conference in this series to take place outside Europe.

It only remains for me to say thank you to those who have worked so hard to organize this event; to Jacqueline Aloisi de Larderel and her staff for their unfailing enthusiasm and hard work; and to all of you without whom the event could not take place. May I wish you a safe journey home. ◆

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A selection from oral and written contributions at the Oxford Seminar

National Cleaner Production Centres: their establishment and growth

Surya Prakash Chandak, Director, National Cleaner Production Centre, India

Abstract

A joint initiative of UNIDO and UNEP has resulted in the establishment of nine National Cleaner Production Centres in Brazil, China, the Czech Republic, India, Mexico, the Slovak Republic, Tanzania, Tunisia and Zimbabwe. These NCPCs have been in operation from a few months to two years, but even during this short time they have had an impact through activities including demonstration projects, training, and creation of awareness. Continued and extended technical and financial support of these Centres is vital for the widespread adoption of CP Principles.

Résumé

Une initiative conjointe de l'ONUDI et du PNUE a abouti à l'établissement de neuf centres de production plus propre, au Brésil, en Chine, en République tchèque, en Inde, au Mexique, en République slovaque, en Tanzanie, en Tunisie et au Zimbabwe. Certains de ces centres fonctionnent depuis quelques mois, d'autres depuis deux ans. Bien qu'il s'agisse là de courtes périodes, elles ont été suffisantes pour que ces centres aient un impact à travers les activités qu'ils ont menées, notamment les projets de démonstration, les sessions de formation et les opérations de sensibilisation. Si l'on veut que l'adoption des principes de production plus propre se répandent, il est vital que ces centres bénéficient de soutiens techniques et financiers continus et élargis.

Resumen

Una iniciativa conjunta de UNIDO y UNEP ha dado como resultado el establecimiento de nueve Centros Nacionales de Producción Más Limpia en Brasil, China, la República Checa, India, Méjico, la República Eslovaca, Tanzania, Túnez y Zimbabwe. Algunos de estos CNPLs funcionan desde hace unos pocos meses y el más antiguo lleva dos años funcionando. Incluso durante este breve periodo de tiempo estos Centros han sido capaces de producir un efecto a través de sus actividades que incluían los proyectos de demostración, de formación y de concienciación. El prolongado y sostenido soporte técnico y financiero de estos centros es de vital importancia para conseguir que se adopte de forma mayoritaria los Principios de la CP (producción más limpia).

"The NCPC programme of UNIDO and UNEP is definitely a significant effort of these institutions to bring development to developing countries on a sound cleaner production basis"

Dr Carlos Nascimento, NCPC Brazil

Genesis

The NCPC programme is a joint initiative of the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme Industry and Environment centre (UNEP IE).

This programme has been designed in two phases. The first is an experimental phase involving a limited number of Centres. With the experience from this phase it is envisaged that more Centres will be set up in the second phase. During the first phase, eight NCPCs have been set up in the following developing countries and economies in transition: Brazil, China, the Czech Republic, India, Mexico, the Slovak Republic, Tanzania and Zimbabwe. **(A Centre was established in Tunisia after this article was written.)**

This article briefly describes the establishment and growth of the first eight NCPCs.

The role of NCPCs

"NCPCs have major roles to play in the development of the developing nations. The NCPC programme can be used as a tool for developing business between developed and developing countries"

Lewin Mombemuriwo, NCPC Zimbabwe

The NCPCs will serve a coordinating and catalytic role in regard to cleaner production (CP). They will become the core of a network of institutions and individuals involved in CP activities. To play that role, the NCPCs' activity profile has been designed to cover four areas: in-plant demonstrations; training; information dissemination; and policy assessment.

Thus, the overall objective of the programme is to facilitate the transfer of Cleaner Industrial Production (CIP) information and technology from developed and developing countries to industrial enterprises and environmental management agencies in developing countries and economies in transition. This would allow them to incorporate CIP techniques and thus reduce industrial pollution.

"We think that the NCPCs play a very important role, to bring environmental awareness or tools for sustainable development to the developing countries" Dr Carlos Nascimento, NCPC Brazil

The structure of NCPCs

Every NCPC is hosted by a local organization which provides the infrastructural/physical facilities and all staff excluding the Director. A Modality of Operation, signed by the host organization and UNIDO, states the inputs provided by each of them and also spells out the activities to be undertaken by the respective NCPC.

Each NCPC has an Advisory Board made up of the most important CP players in the host country. The members of the Board could be drawn from education and research institutions, industry and environment ministries, chambers of commerce, local UNIDO representation, etc. The Advisory Board guides the NCPC's activities and supports it when necessary. Each NCPC is linked to a Counterpart Institution, which is to provide continuous professional support by sharing its expertise and assisting the Centres in implementing their activity plans. The matching of the NCPCs and the Counterpart Institutions is as follows:

China and Tunisia	IVAM, the Netherlands
Zimbabwe	IVAM and Erasmus University, the Netherlands
Czech and Slovak Republics	Stenum, Austria
India	Danish Technological Institute (DTI)
Mexico	University of Massachusetts at Lowell, USA
Tanzania	Technical University of Denmark (DTU)

Each NCPC is required to develop a work programme – an overall programme for three years and detailed annual work plans. The programme is developed in consultation with the Counterpart Institution and becomes the basic blueprint for the NCPC's activities. The organizational structure and the personnel of the NCPCs are given in Annex 1.

Funding of NCPCs

The funding pattern of the programme so far has been as follows:

Netherlands	US$ 1.5 million
Austria	0.8 million
UNEP	1.0 million
Brazil	0.3 million
UNIDO	0.5 million
	US$ 4.1 million

Growth and performance of the NCPCs

As already mentioned, eight UNIDO-UNEP sponsored NCPCs have been operationalized in Phase I of the programme in different parts of the world.

"Our first commitment has been so far to start. By now we have been on schedule and with big support of all institutions involved" Ms Susana Hurtado Baker, NCPC Mexico

The operational age of these NCPCs varies from a few months to two years. Consequently, their activity profiles and achievements also vary widely. The inherited background knowledge base also varies from virtually none to significant experience. Obviously, the growth and activity profile of NCPCs covers a wide spectrum. The differences in industrial profile, culture, etc. in different countries further increase the spread.

Despite these differences, all the NCPCs have given a commendable performance in terms of conducting the activities envisaged to achieve their objectives. It should be recognized here that it is neither desirable nor possible to undertake all four activity components simultaneously. While activities in three of these (information dissemination for awareness creation, in-plant demonstration, and training) could be taken up more or less in parallel, the activities pertaining to policy-level interventions can start only after some progress has been made in the other three fields. Of the eight NCPCs, therefore, only a few have started working in the area of policy assessment. **Table 1** shows the progress of NCPCs at a glance, based on information which could be collected from them in a short time.

In-plant demonstration projects

Each NCPC is required to conduct about five demonstration projects every year. Forty demonstration projects were taken up by NCPCs in 1995, to which another 41 were added in 1996. These demonstration projects are spread over diverse sectors such as textiles, pulp and paper, breweries, electroplating, etc. There is a wide mix in the coverage of the demonstration projects, ranging from unit level to region-based. It is not intended to describe the gains of the demonstration projects (number of CP options, pollution load reduction, savings achieved, etc.), as this would reflect the effectiveness of CP but not necessarily of the NCPCs. It is important to mention that more than 100 projects are being managed by just 16 people (an average of two per NCPC).

Training and awareness

Different types of training have been envisaged in the NCPCs' activity programmes, including training associated with demonstration projects, awareness training, intensive training to develop professionals, etc. Effective training is doubly useful: it builds a set of trained persons, who the further support and disseminate the concept of cleaner production. The statistics of NCPC performance in terms of number of people trained is more than impressive. NCPC China has organized over 30 CP audit training programmes, with more than 2000 trainees. It has formed a CP auditor group with over 100 members.

Some of the NCPCs have also been able to use electronic media for information dissemination. NCPC Czech Republic has had four radio presentations and one on TV. NCPC India had a three-hour interactive satellite TV programme with 11 centres.

Almost all the NCPCs have published articles and made presentations in national and international seminars. The total number of paper publications presented is well over 100.

Other activities

The activities of the NCPCs are not limited to demonstration projects, training, and awareness creation. A host of other activities have also been carried out, quite a few on the Centres' own initiative. Some of these activities are:

Mr Miguel R. Lapena, Director, Environment and Energy Branch of UNIDO, chairing the session on "Cleaner Production, Beyond Demonstration"

Publications

1. *Cleaner Production – All You Wanted to Know But Could Not Ask*, NCPC India;
2. Cleaner Production Manual – NCPC Czech Republic;
3. Manual of Enterprise Cleaner Production Audit and Training Material, NCPC China;
4. Collected works on CP in China – NCPC China;
5. Coloured brochure about CP in China – NCPC China;
6. Guideline for CP Audit of Pulp and Paper Enterprise in China – NCPC China ;
7. Brochures: All NCPCs;
8. Newsletters: NCPC Zimbabwe, NCPC Tanzania, NCPC Mexico, NCPC Czech Republic, NCPC China.

Assistance to neighbouring countries

1. NCPC Brazil conducted two seminars in Uruguay.
2. NCPC India conducted CP Audit Training and supervised five CP Audits in Sri Lanka.
3. NCPC India conducted sector-specific CP Audit Training (pulp and paper industry) and initiated CP Audits in pulp and paper industries in Vietnam, Indonesia, Malaysia and Thailand.

Inputs to other projects' programmes

1. Cleaner Production Programme of Ministry of Environment - NCPC Czech Republic;
2. Short-term courses on Cleaner Production with US EPA - NCPC Czech Republic;
3. UNEP's NIEM Project on the pulp and paper industry - NCPC China and NCPC India;
4. World Bank Project on Environmental Technology Assistance to China – NCPC China;
5. The Project Technology for International Environmental Solution (TIES) of the Illinois EPA–NCPC China;
6. Sino-Canada Cooperation Project on Policy and Management for CP in China – NCPC China;
7. World Bank Southwest Poverty Reduction Project in China - NCPC China.

Cost-effectiveness of NCPCs

There could be several criteria for judging and assessing the effectiveness of NCPCs, ranging from the extent of coverage of their activity plan to the extent of penetration of cleaner production in manufacturing industries. It is also true that some of the criteria could be qualitative and judgement-based. Probably the donors to the programme would be more interested in knowing how effectively their money is being spent. At least in comparison with other bilateral or direct donor-oriented programmes, NCPC as an institutional framework is far more cost-effective.

The average annual budget of each NCPC (excluding the budget for international experts) available for conducting its various activities is US$ 60,000. Thus, the total annual budget for all the eight Centres together is roughly US$ 4,800,000. Assuming that the budget is used according to the ratio of 75:25 for in-plant demonstration and training, including information dissemination activities, the cost-effectiveness of the activities works out as follows:

Cost-effectiveness of demonstration projects

On an average, 40 demonstration projects are conducted by NCPCs every year. Seventy-five per cent of the total budget works out to US$ 360,007. Thus, the cost per demonstration project works out to roughly US$ 9000.

Cost-effectiveness of training and information dissemination

It has been further assumed that the cost distribution between intensive/demonstration training and information dissemination awareness is in the ratio of 75:25. The NCPCs have provided intensive training to approximately 400 trainees every year, giving the cost per participant as $US 225. Comparing it with the expenditure incurred on other internationally assisted training programmes, the cost is just a small fraction (e.g. the participation fee for the Intensive Training Programme on Management of Sustainability, conducted by the Sustainability Challenge Foundation, is 14 times greater). Also, taking the number of direct beneficiaries of Information Dissemination as 1500, this activity has been carried out at a nominal cost of $US 20 per participant.

It should be noted that the above cost includes the establishment of the NCPC, the cost of preparing the basic training material, etc. As NCPCs mature and stabilize, it will come down further.

While the above figures present an attractive picture of NCPCs in comparison to other international efforts for such activities, they also give pointers for future programmes:

1. The cost of demonstration projects is still quite high from the point of view of the paying capability of industries in developing countries. This programme would therefore need subsidization/source of funding for continuance.
2. The cost of intensive training is much lower than the cost incurred by developing countries in participating in international training programmes. The cost is likely to come down after a few initial programmes, due to the elimination of training material preparation costs. The training could therefore be a self-financing activity of NCPCs.
3. The cost of information dissemination is also too high to be directly borne by the information recipient. In fact, in developing countries the recipient is hardly prepared to pay even the initial cost of awareness information. This activity would therefore also have to be fully subsidized and funded.

Appeal from NCPCs to donors

You planned to develop orchards. You sowed the seeds. The saplings have now come out. Their branches are still not strong enough. Don't leave them on their own to face the vagaries of the weather. Their roots are not strong enough to hold them against storms, to draw water and nutrition from the ground. They still need support. On behalf of all the NCPCs, I request you to extend the support for some more time. Take care of the saplings till they become strong enough to stand on their own. I can assure you that they will then continue to yield fruit for years to come.

Sustainability of NCPCs

The issue of self-sustainability of NCPCs after the termination of support from and through UNIDO/UNEP is often raised.

"It would sound realistic to expect NCPC to be self-sustaining in three to five years and therefore there will still be need to get international support although at reduced rate after the first five years. The nature of the support after the first five years should be in the form of finance, technical and material information"

Lewin Monbemuriwo, NCPC Zimbabwe

The sustainability of NCPCs can be viewed keeping in mind two important considerations

Technical sustainability

The experience of NCPCs in Phase I shows that three years is too short a period for them to fully develop and become technically self-reliant. It should not be ignored that, during this period, almost 30 per cent of the time has been spent on initial establishment and related work. Thus, the actual time available for professional development has been much less. It is essential that the originally envisaged time schedule of five years of support is adhered to.

Financial sustainability

"We consider that promotional CP activities should be subsidized by domestic governments also after the donor assistance is over (on average by 50 per cent). Otherwise the NCPC is becoming a commercial firm not really interested to transfer its know-how to others"

Vladimir Dobes, NCPC Czech Republic

All the NCPC personnel feel that insistence on the NCPCs becoming financially self-sustainable would turn them into CP consulting organizations. In other words, NCPCs would cease to take up the important activities of information dissemination and training. It would therefore be desirable that NCPCs be allowed to develop as CP promotion organizations capable of providing expert technical help as and where required. They should support creation and development of local consulting organizations instead of turning themselves into commercial consulting organizations. While such a role would be of long-term interest and benefit to the concerned country, it would also require financial support for a much longer period. However, once the basic capacities and

capabilities are built up, the extent of support required would be limited only to conducting activities and would therefore be significantly lower compared with the present level.

"Different countries have quite different development stages and therefore different support needs. Perhaps it would be more sensible if there would be the possibility for each country, in agreement with UNIDO and UNEP, to decide its own span of support"

Dr Carlos Nascimento, NCPC Brazil

Recommendations

Two years of experience have shown that industrial enterprises still do not take up cleaner production with the commitment and enthusiasm that is expected and desired.

"It is still difficult to make CP a real priority within all enterprises participating in our projects, and the level of involvement of particular enterprises is very different in this case. However, the average involvement is increasing each year"

Vladimir Dobes, NCPC Czech Republic

CP demonstration projects and CP awareness creation would continue to be much desired activities, but conducting these activities would require external support.

In light of the above, the following brief recommendations are made.

For promoting adoption of cleaner production:

1. formulating and insisting on an explicit requirement of CP in all internationally funded/assisted industrial development and environment-related projects;
2. creating international pressure for the establishment of market-based instruments which automatically favour and promote CP.

For sustainability and enhanced effectiveness of NCPCs:

1. continuance of and, if possible, enhancement of the present pattern of support for a period of five years. Further support to be determined on case-by-case basis.

"The duration of support to NCPCs should be a minimum of five years to allow absorption, comprehension and acceptance of the new concept by local industries as a management tool and consequently to be able to support CP activities financially"

Professor C.L.C. Migiro, NCPC Tanzania

2. recognition, development and support of NCPCs as the most appropriate focal bodies for institutionalization of Environmental Management Systems, viz. ISO 14000. ◆

Table 1
Progress of the first eight NCPCs at a glance

Activity Area	NCPC							
	China	Czech R.	Slovak R.	Zimbabwe	Tanzania	India	Mexico	Brazil
Number of Demonstration Projects								
1995	8	12	10	6	NF	4	NF	NF
1996	30	4 LT (30 units)	No info	5	16	5	6	5
Number of Participants in Training Programmes								
1995								
Demonstration Training	89	57	15	5	NF	16	NF	NF
Intensive Training	120	No info	No info	68	NF	-	NF	NF
Awareness Programmes	No info	No info	No info	200	NF	200	NF	NF
1996								
Demonstration Training	49	90	No info	4	No info	70	-	-
Intensive Training	No info	-	No info	43	35	37	25	-
Awareness Programmes	1000	44	No	98	47	350	500	600

NF: Not functioning LT: Long-term project

Annex 1
Organizational structure and personnel of the NCPCs

China
The China NCPC (CNCPC) was set up at Beijing in March 1995 in conjunction with the National Environment Protection Agency (NEPA) and Chinese Research Academy of Environmental Science (CRAES). It has eight staff members, with backgrounds ranging from chemistry, chemical and environmental engineering, to geography and geology. The Centre is lead by Dr Ning Duan as Director.

Czech Republic
The Czech NCPC (CCPC) is based in the building of its host institution, the Czech Environment Management Centre (CEMC) in Prague. The office counts four staff including Mr Vladimir Dobes, the Director, and Mr Masato Kawanishi, UNIDO associate expert. The CCPC cooperates very closely with a network of national CP experts who were trained in a three-year Cleaner Production Capacity Building Programme financed by the Norwegian Government.

Slovak Republic
The Slovak NCPC (SCPC) is based in the building of its host institution, the Slovak Environment Agency in Bratislava. The centre has four staff including Mr Anton Blazej, the Director. The SCPC cooperates very closely with a network of national CP experts who were trained in a three-year Cleaner Production Capacity Building Programme financed by the Norwegian Government.

India
The NCPC India was set up at New Delhi in July 1995. The host institution is the National Productivity Council, which is an autonomous institution attached to the Ministry of Industry, Government of India. The Centre has three staff members including Mr Surya Prakash Chandak, the Director.

Zimbabwe
The NCPC Zimbabwe was set up at Harare in November 1995 under the umbrella of the Environmental Forum of Zimbabwe, an organization of the Chief Executives of major corporations, who share a common environmental concern.

Tanzania
The Cleaner Production Centre of Tanzania was set up at Dar es Salaam in October 1995. The base institution is the Tanzania Industrial Research and Development Organization. The Centre has four staff members including the Director, Professor C.L.C. Migiro.

Mexico
The Mexican Cleaner Production Centre (MCPC) was set up at Mexico in December 1995. The host institution is Instituto Politecnico Nacional. The Centre is headed by Ms Susana J. Hurtado Baker, its Director.

Brazil
The NCPC Brazil was officially started in July 1995, though the actual starting date is December 1995. The national host institution is Servico Nacional de Aprendizagem Industrial (SENAI) at Porto Alegre. The Centre has four staff members including Dr Carlos Adilio Maia do Nascimento, the Director.

End-of-the-pipe clean and lean technologies

Friedrich Schmidt-Bleek, Vice-President, Wuppertal Institut, Döppersberg 19, D-42103 Wuppertal, Germany

What with alarmingly high pollution levels in the 1960s, industrialized countries launched a first wave of pollution control standards for ambient air and water quality and for emissions. As everyone had to obey the law, little incentive was felt to look for new technology. Rather, the technical response consisted primarily in "tightening up" existing equipment, irrespective of costs. Individual noxious compounds were filtered from exhausts, were burned, were caught in special sewage treatment plants, and declared to be dangerous waste. In short, the end-of-the-pipe solutions began their successful march through western economies. In order to control and monitor the new standards of performance, greatly improved analytical instruments were also created. In Germany today, more than 900,000 jobs are counted in the field of "environmental technology and services" with the numbers still climbing.

However, manufacturing secondary technology for the main purpose of cleaning up the dirt generated by the primary (existing) ones does not seem to make much sense from a macroeconomic point of view – even though it may be good business for individual firms. Without order and command legislation, this development would be unthinkable from a technical as well as economic point of view. This development also calls for policing, it obviously costs more money and resources overall, and thus inevitably has the political consequence that businesses and countries can conveniently argue that they needed to prosper in the first place in order to afford environmental protection. Along these lines, harmonizing performance on the international level is difficult indeed. And this in turn has dire consequences for the chances to improve the environmental quality of products and services in world trade.

Rather than working at the tail end only, some manufacturers began early to improve the processes themselves, to cut out waste and save energy. The technical fight against pollution progressively became an integrated approach. The highly successful Cleaner Production Programme of UNEP IE was launched in 1990, preparing a more level playing field for reaching sustainability. Knowledge and know-how spread quickly worldwide through systematic information exchange. Some 45 countries are presently engaged in this joint programme.

In order to approach ecological sustainability of our economies, we must now consider undertaking a third wave of efforts to improve technical solutions even further.

Let us begin by reminding ourselves that it is not possible to dislocate materials from their natural positions without irreversibly changing the evolution of the ecosphere. Digging for resources, plowing fields, and redirecting water means changing the environment. This also implies that no product and no technology-dependent service can ever be environmentally neutral. However, it is equally apparent that huge differences can exist in the specific overall consumption of resources which are invested for producing a specific benefit.[1] The material inputs per unit service derived – the MIPS – can vary widely, and it is the task of future technology to minimize MIPS or, in other words, to work toward the best possible resource productivity, from cradle to cradle.[2] I call this approach **lean technology**. Progress in improving the resource productivity of technical approaches can be quantified, and competing technologies can be compared on numerical grounds.[3]

In order to get a feeling of how *fat* current technology really is, let us look at some numbers.

If China ever reached the car per person ratio of the United States, some 20 per cent of its arable land would have to be covered with roads and parking spaces. In Germany today, each person lays claim to 70 tonnes per year of solid nature in order to enjoy her and his way of life. Some 20 tonnes goes into the building sector annually, the health system swallowing 1.5 (!). Some 50 per cent of the required material streams is put in motion in other countries for Germany, and far less than 50 per cent of these streams has any economic value, like overburdens for example. Additionally, each German needs 600 tonnes of water per year, of which only 0.2 per cent is needed for sustaining each human body biologically. On the average, for each tonne of product manufactured in Germany, some tonnes of nature are invested. *In toto*, man now puts in motion three times more solid material on the continents than do natural forces.

Some of the consequences of this lust for ever more, ever higher and ever faster are known to us already, like forest diebacks, massive loss of topsoil, mad cow disease, 75,000 hectares of land subsiding in Germany due to coal mining (pumped day and night to keep the land from being flooded with water), an increase in the speed of the earth's rotation, and intensive floodings in most countries. Other consequences have not yet materialized but may be just over the horizon, like climate change and new diseases.

At present, some 85 per cent of the technology-driven material streams provides the basis for the wealth of only 20 per cent of humankind. However, as the industrialized throughput economies have turned out to be "the standard of success", the rest are trying to catch up. If eight billion people were ever to reach this kind of extreme material and energy-intensive civilization, a rapid ecological collapse would be the inescapable result.

The simple consequence is this: either we increase the resource productivity of our way of life sharply or we go broke as humans on this earth – the only host planet we have. We must provide the goods we need with much less resource inputs, from cradle and back to cradle. For the industrialized countries the goal is estimated by experts to be a ten-fold dematerialization, leaving some room for other countries to grow in resource intensity.[4] A huge and worldwide innovation gap must obviously be filled as quickly as possible with lean technologies. This is no pipe dream. Experience in industry has shown that working in this direction can pay, even though current prices for resources are not particularly conducive toward this end.[5]

Definitions

Lean products are technical artifacts (products, constructions, infrastructures) providing end use satisfaction with a minimum of natural resources (materials, energy, and space) "from cradle to cradle".

Equal to these are technical artifacts exhibiting the highest possible resource productivity "from cradle to cradle".

Lean production is the sum total of technical processes for making **lean products** available for end use.

Lean services make use of **clean and lean products** or are provided without technical means.

[1] Schmidt-Bleek, F. "Increasing Resource Productivity On The Way To Sustainability", *Industry and Environment* – UNEP IE 20 years – UNEP IE (Hrsg.), volume 18, No. 1, October-December 1995.

[2] Schmidt-Bleek, F. "Wieviel Umwelt braucht der Mensch? – mips, das Mass für ökologishes Wirtschaften", Basel, 1993 (In English: The Fossil Makers).

[3] MAIA Handbuch, Schmidt-Bleek, Ed., Wuppertal Institut, Germany.

[4] Carnoules Declaration 1994/94 by the FACTOR 10 CLUB.

[5] Schmidt-Bleek, F. and Tischner, U. "Produktentwicklung: Nutzen gestalten – Natur schonen Anstittung zur Kreativitaät pro Unmwelt". Wirtschattskammer Österreich (Hrsg.) Wien, 1995, Weizsäcker, E.U. von/Lovins, A. und H. "Faktor Vier", München, 1995; Fussler, C.: "Driving Eco Innovation", London, 1996.

Permits and promotion of cleaner production

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In many countries permits or authorizations are granted in a procedural manner. This means that, taking into account the prevailing laws and regulations, an authorization is acquired in which a number of conditions are prescribed. It is a contract between the two parties: one is giving certain rights and the other party has to comply. Control mechanisms take care of the enforcement. These conditions are supposed to be enforceable.

It is the responsibility of the authorities to prescribe realistic conditions that can be met by the company or enterprise involved. Authorities are wary of prescribing detailed process conditions and/or processes, as this runs the risk that the conditions, in a particular case, cannot be met.

Prescribing a cleaner technology process in permitting is therefore not done in practice.

What other tools are available? How can industry be enticed to adopt cleaner technologies? A number of tools are shown here, varying from soft to hard approaches. All are a matter of available and accruable funds. Once a cleaner technology has been proven, and much better emission data are established in a country for that particular process in that particular branch of activities, authorities prescribe fixed emission data through regulations and permits. These emission data are, in that case, considered realistic. By prescribing these emission data, authorities ensure that the (or a) cleaner technology will have to be used. This is the indirect way. Promotion works through demonstration and dissemination, followed by permitting.

Promoting self-conscious behaviour: Environmental management systems (EMS), environmental care, and voluntarily becoming part of an ECO Management and Audit Scheme (EMAS) will be used by authorities in the "soft approach" to industry. A tool box of instruments are available, and the right mix has to be chosen by authorities in order to find approaches to which industry or trade organizations will be receptive. The "carrot-and-the-stick" approach always works in the end.

Permit

Definition:

A permit is a contract between the "operator" and the authority providing the contract.

The authorities provide a right to the enterprise to operate.

At the same time the contract describes the conditions under which operation is allowed in ENFORCEABLE terminology.

The contract has CLEAR conditions that are enforceable, which means they will "STAND IN COURT" in case non-compliance leads to court procedures.

What is put into a permit nowadays:

- Considerations of the permitting authority
  - general rules of proper behaviour
  - explanations on state of the art.
- Enforceable conditions
  - emissions
  - safety measures
  - monitoring obligations
  - reporting

What is considered in permitting process:

BPM	Best Practicable Means
BAT	Best Available Technology
BAT NEEC	BAT – Not Entailing Excessive Cost
BACT	Best Available Control Technology
BPEO	Best Practicable Environmental Option
EMS	Environmental Management System
EMAS	ECO Management and Audit Scheme

AUTHORITIES CAN NOT PRESCRIBE A CLEANER TECHNLOGY IN PERMITS ONLY EMISSIONS/IMPACT LIMITATIONS THAT ARE ENFORCEABLE

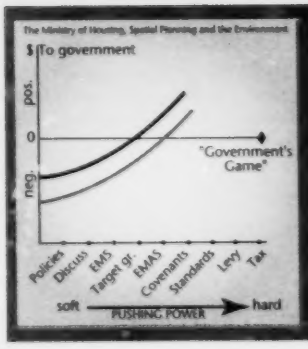
Promotion of Cleaner Production

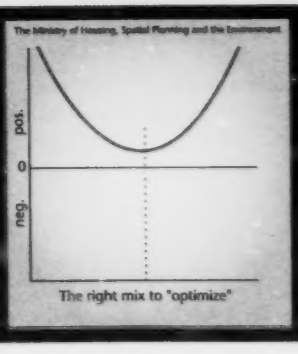
Soft Approach

- Strategy on promoting subsidies on demonstration projects
- Appeal to industry responsibility
- Target group approach
- Covenants
- ISO 900/14000
- EMAS (volumtary)
- Voluntary EMS (in permit consideration)

Hard Approach

- Exclusion of production
- Exclusive production methods
- Taxes
- Levies and recycling of funds
- Emission standards
- Compulsory EMAS
- Permitting with EMS





In conclusion

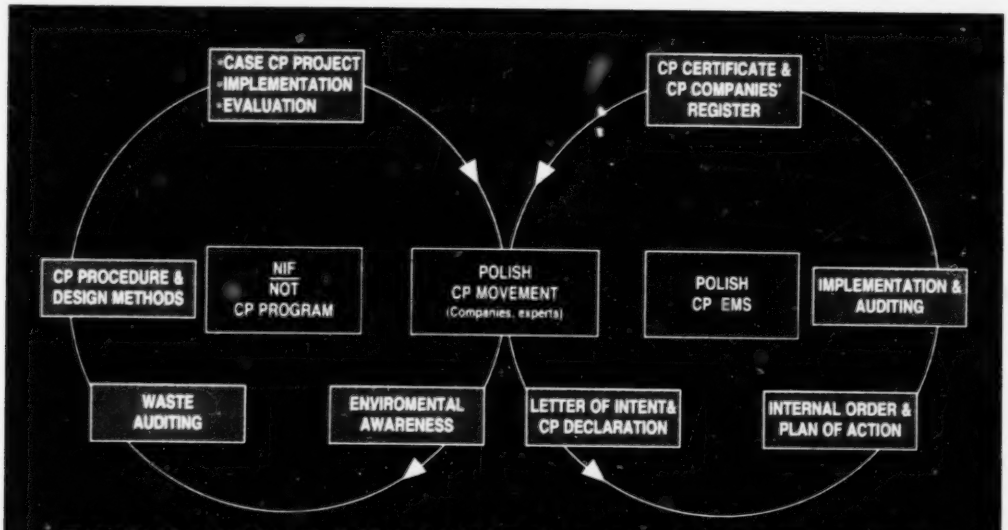
Promotion of cleaner production:

- not easily done by permitting
- scope for change in permitting procedures
- "tool kit" still has to be developed

EMS, EMAS and COVENANTS are still in developing stage for the promotion of cleaner technology.

Cleaner production in Poland: from CP to environmental management systems

Zygfryd Nowak, Director, Polish Cleaner Production Center, ul.Krasinskiego 13, 40-019 Katowice, Poland



THE POLISH CP ENVIRONMENTAL MANAGEMENT SYSTEM

The building up of the Polish CP Environmental Management System can be seen on the right side of the figure above and compared with the Training Activity on left side.

The NIF – NOT CP Program – running in cycles (with the main steps shown on the left side) called CP Schools – 2nd together until now – resulted in a great number of trained CP companies and qualified CP experts spreaded all over the country. They needed a structure for the continuation of their activity after they left the program.

Steps have been taken by the Polish Federation of Engineering Societies NOT to formalize the activity and get it into the Government structure, ensure continuation of CP system in the company and a proper auditing of the follow-up. These main steps forming together the CP Environmental Management System can be seen on the right side of the picture [1; 2]. The last step, closing the loop, is the CP Certificate for the company, assigning to CP and manufacturing CP strategy as a management system for its development. The results of the introduction of the CP EMS for the mentioned above SKOTAN TANNERY are presented in the table below. A register for these CP companies has been introduced.

Both activities – the NIF-NOT CP Program and the Polish CP EMS join in what is called the Polish CP Movement, where discussion and advisory work is organized and carried out. The structure of this movement is utilizing the existing administrative structure of the Federation and uses its organizational experience existing for many years. It is shown in the last chapter of this paper.

CP CERTIFICATE APPLICATION

QUANTITATIVE STATEMENT OF THE COMPANY "SKOTAN"

	1991	1992	1993	1994	1995
PRODUCTION	100%	118%	126%	139%	183%
PRODUCT YIELD FROM RAW MATERIAL	100%	100%	107%	106%	104%
SPECIFIC ELECTRICITY CONSUMPTION	100%	90%	82%	73%	59%
SPECIFIC WATER CONSUMPTION	100%	66%	62%	58%	47%
SPECIFIC SOLID WASTE LOAD	100%	74%	60%	50%	38%
SPECIFIC LIQUID WASTE LOAD	100%	55%	47%	43%	34%
SPECIFIC GASEOUS WASTE LOAD	100%	39%	33%	24%	19%
SAVINGS FROM CP		100%	328%	411%	670%
	BEFORE CP	CP YEAR	AFTER INTRODUCING CP		

CP FINANCING – THE CHALLENGE FOR CP DISSEMINATION

How to develop and introduce incentives and a proper financial mechanism has been the main challenge for CP all over the world for many years. The lack of understanding and recognition of the "triple dividend" of CP (profit-environment-health) improves technology, product, service and increases the economical benefits is still the main constraint for the wide spreading of the strategy in all developing countries. It is no different for Poland. A new, original solution for this problem will be the decisive breakthrough for CP dissemination. Without creating financial tools CP will become in the future only one of the very nice and interesting ideas for the environmental policies and strategies.

[1] Z. Nowak, Polish Cleaner Production Programme – NGOs in action, UNEP, *Industry and Environment*, Vol. 16 N° 4, 1993

[2] Z. Nowak, Cleaner production in Poland: aiming at a joint industrial and environmental policy, UNEP, *Industry and Environment*, Vol. 17 N° 4, 1994

The Polish Cleaner Production Centre has granted the "Cleaner Production Certificate" (reproduced below) to 63 companies which have demonstrated that they are using CP procedures in their production and environmental policy, and have obtained reasonable environmental and economic results.

Minister Przemysłu i Handlu

Dyrektor Centrum Badań i Certyfikacji

Prezes Federacji NOT

n a d a j ą

ŚWIADECTWO PRZEDSIĘBIORSTWA CZYSTSZEJ PRODUKCJI

. . . . . .

Sygnatariuszowi Deklaracji CP nr . . . . . za wprowadzenie i stosowanie Czystszej Produkcji jako Systemu Zarządzania Produkcją i Środowiskiem Naturalnym stosownie do rozdziału 30 Agendy XXI – Światowego Szczytu Ekologicznego RIO 1992 oraz do złożonego w tej sprawie oświadczenia stanowiącego podstawę do wydania niniejszego świadectwa.

Świadectwo upoważnia do:

* używania znaku wzorcowego CP – polskiego Ruchu CP – na produktach i dokumentach przedsiębiorstwa,
* do priorytetowej rekomendacji starań o środki finansowe na proefektywną i proekologiczną działalność,
* wpisu do publikowanej „Księgi Przedsiębiorstw Czystszej Produkcji"

Specimen

Świadectwo podlega końcowej weryfikacji w 1998 roku.

W Federacji NOT prowadzony i publikowany jest Rejestr Przedsiębiorstw CP.

Warszawa, ...

Minister Przemysłu Handlu

Dyrektor Centrum Badań i Certyfikacji

Prezes Federacji NOT

Klemens Ścierski

Andrzej Zieliński

Powyższe Świadectwo zarejestrowano pod nr . . . . . .

Environmental protection and Asian economic development

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Abstract

Five stages can be identified in the evolution of ecologically efficient corporate management: 1) general indifference; 2) the dawning of public awareness; 3) the beginning of corporations' taking initiatives beyond what is legally required of them; 4) the stage at which eco-efficiency becomes the main factor in corporate decision-making; and 5) the stage (still only theoretical today) at which environmental costs are internalized in corporate accounting. Most east Asian countries are at the second stage, but there is wide awareness of the importance of moving into the third and fourth stages as rapidly as possible.

Résumé

On peut distinguer cinq stades dans l'avènement et la mise en place d'une gestion environnementale efficace au sein des entreprises : 1) indifférence générale ; 2) prise de conscience dans la population ; 3) lancement, par les entreprises, d'initiatives allant au-delà de leurs obligations légales ; 4) stade auquel l'éco-efficacité devient le facteur qui prime dans les décisions des entreprises ; et 5) prise en compte (encore théorique, à l'heure actuelle) des coûts du respect de l'environnement dans la comptabilité interne des sociétés. La plupart des pays d'Asie en sont au deuxième stade, mais il existe une réelle prise de conscience en ce qui concerne la nécessité de passer aux troisième et quatrième stades dès que possible.

Resumen

Es posible identificar cinco etapas en la evolución de la gestión corporativa ecológicamente eficiente: 1) indiferencia general; 2) comienza a formarse una consciencia pública; 3) las corporaciones comienzan a desarrollar iniciativas que exceden los requisitos legales; 4) la etapa en la que la eco-eficiencia se transforma en el factor principal en la toma de decisiones corporativa; y 5) la etapa (aún teórica) en la que los costes medioambientales son incluidos en la contabilidad corporativa. La mayoría de los países asiáticos se encuentran en la segunda etapa pero existe una amplia consciencia de lo importante que es desplazarse hacia la tercera y cuarta etapas lo más rápidamente posible.

I. The paradox of ecological efficiency

The World Business Council for Sustained Development defines the ecological efficiency required to achieve long-term sustainable growth as something that is reached by "the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout their life cycle to a level at least in line with the earth's estimated carrying capacity." On the one hand, eco-efficiency requires the delivery of competitively priced goods and services as well as the enhancement of the quality of human life. Simultaneously, eco-efficiency requires reducing the ecological impact and resource intensity of our economic activities at least to levels compatible with the Earth's carrying capacity.

Herein lies the tragic paradox of the two opposing goals demanded by the task of sustainable growth through ecological efficiency. The first goal really refers to economic growth through market discipline. The human record in this aspect is quite poor and any partial success in liberating us from poverty is almost completely indebted to the development of modern technologies and manufacturing industries in some parts of the world. However, economic growth driven by the manufacturing industry has a terrible reputation on environmental pollution. Thus far we do not seem to have an effective and viable alternative paradigm of development.

The past success of achieving prosperity in only 20 per cent of the world, which consumes 80 per cent of the available resources of the world, is based on the paradigm that the environmental degradation and depletion of limited resources in the process of industrialization is something that has to be tolerated in the name of achieving prosperity. At least for two reasons there is something fundamentally wrong with our development paradigm. Past development was environmentally unfriendly, and prosperity was limited to a far too small number of people.

It is of paramount importance that this 80 per cent of global consumption by 20 per cent of the world population be reduced to a level compatible with the Earth's carrying capacity, which is said to be a 75-90 per cent reduction of present consumption per unit of economic value, according to Wuppertal Institute of Germany claims. It is equally important that the newly developing countries of Asia and Africa join the franchise of prosperity this time through a correct paradigm by paying proper attention to the limited carrying capacity of our Earth. This is the question that I wish to pose to you today by introducing the limitations and frustrations of eco-efficient economic growth and corporate management in Asian countries.

II. Asian economic growth and environment

At the end of the day, east Asian countries will be regarded as the first examples of truly poor countries which have succeeded in gaining some prosperity. The root cause of this phenomenon is industrial migrations, the movement of wealth creating devices rather than wealth itself, from America to Japan, then to NICs.

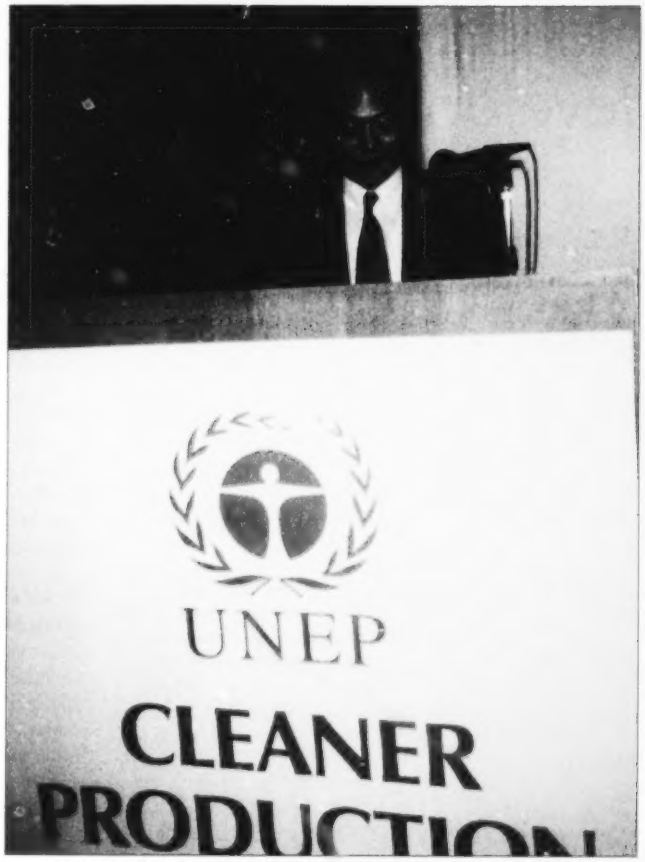
Over time any industry becomes old and mature, while the market becomes massive and the production process huge in scale. The international competitiveness of these industries deteriorates seriously in the countries where they originated. The old style wisdom of industrial portfolio theories (the proverbial cycle from star to cash cow, then cash cow to dog) suggests that the dog be killed. In east Asia, the declining sunset industry is saved by introducing the art of an intra-industry division of labour and international specialization. Here the products are divided into several segments over the quality grades (e.g. expensive TV's vs. cheaper entry models) and the production processes are divided into several segments over degree of labour intensity and technology requirements. Typically simple labour intensive assembly operations which produce very cheap colour TV's are emigrated to the Philippines or Sri Lanka. The role of supplying sophisticated components and final products using complicated capital intensive processes are retained in the home country. This is a new form of modern production technology as opposed to core product technology. Not all countries are benefited by this process of industrial migration, but some have succeeded so well that they are forced to emigrate their industries over time. This is a marvelous process of proliferation of prosperity which is almost completely caused by the work of the free market forces.

It is clear from the above discussion that even the limited success of economic development in east Asia, seen from the environmental protection point of view, is based on the wrong paradigm again. First, the limitation of the domestic mar-

kets of the east Asian countries forced their industrial development plans to target the advanced country markets in Europe and North America. In so doing they had to focus on the development of mature industries which (1) have long histories of consumption, (2) are capable of mass consumption and mass production, and (3) have relatively easy access to production technologies in contrast to core scientific technologies. East Asian competitiveness arose from the opportunity to substantially improve these production technologies and to apply them to mass productions with scale merit. The industries which migrated to Japan and other NICs from the US and Europe were typically characterized by large-scale material and feed stock inputs, massive scale outputs, and capability for large-scale and systematic transportation to far places of the world, which also required extensive packaging and repackaging processes.

Mature production and process technologies are very energy intensive and ecologically inefficient because the migrating technologies are the mature and old-style production processes rather than the newer high-technology and eco-efficient processes. Slowly and steadily the east Asian countries are offering their living environment as the dumping ground for the environmentally pernicious Rust Belt industries in order to supply low-cost consumption goods to the rich advanced nations at the expense of their own backyard environment, for the reward of riding the train of prosperity.

As we will see in the following section, the greater tragedy for the developing countries of east Asia is that, except for Japan, they are technologically less prepared for and financially less capable of introducing autonomously eco-efficient and environmentally friendly new products and production processes. In other words, the paradigm here is grow first in the old ways and worry about the environment later, just as the old industrial countries did.



Mr Ungush Park, President of Samsung Petrochemical Co., Ltd.

III. Five stages in ecologically efficient corporate management

Taxonomy is not necessarily an effective theoretical tool in understanding the details of complex social phenomena. However, it can be a very useful device in helping to understand the sweeping broad historical trends which sometimes display marked quantum jumps in the process of change. To help in understanding the contrast between the corporations of the advanced world and those of the developing world of east Asia in the way they perceive and practise eco-efficient management, I propose the following five stages.

The obvious **first stage** is that of indifference. Even among the advanced Western industrial countries, the blind pursuit of unrestrained prosperity and maximum consumption was the uncontested rule of the game. The famous Nixon-Kruschev Kitchen Debate which took place in the early '60s dramatically symbolizes this erroneous paradigm of economic development. The rapidly developing nations of east Asia have graduated from this primitive stage by now, but in most of the less developing or least developed parts of Asia, and particularly in countries ruled by single Communist Party systems, the concerns of environmental degradation still remain very shallow and environmental policies enunciated by governments tend to be more lip service at the moment. At this stage, most of the public and private corporate management activities are generally free from any environmental interventions originating from either the public sector or from the people in general.

Let me call the **second stage** the stage of public initiation in environmental enhancement. This is the stage where governments are very active in introducing new and powerful regulations on corporate activities in order to prevent further environmental deterioration. Most of the east Asian countries are at this stage. Governments introduce extensive systems of public laws concerning environmental protection at this stage. Japan introduced its basic law to control environmental pollution and enacted other related laws in 1967. It also established a separate government entity for environmental protection at about the same time. The law was revised in 1993 and is now called the Basic Environmental Law. Taiwan established a government agency to conduct industrial pollution controls in 1983 and changed that to an environmental protection agency in 1987. Korea started to introduce laws relevant to environmental protection in 1966 under the name of the Law of Sewage Control, and in 1983 the Law of Environmental Control Corporation was enacted. However, the proper Basic Law of Environment was promulgated in August 1990 and 21 other environmentally related laws were introduced between 1990 and 1995. The Environmental Protection Agency is now a full-fledged ministry. China's first environmental effort was in the form of the National Environmental Protection Conference in 1973. The Environmental Protection Bureau was established in the central government in 1984. The proper Basic Law of Environment was proclaimed at the 5th People's General Assembly in 1979. However, as is widely known, actual public activity in environmental protection in China remains more of an enigma.

At this stage, the environmental awareness of the people in general rises very sharply and adds great pressure on many corporate and public activities. Various NGOs and civic pressure groups arise with both rational and irrational demands. The Taiwan government finds great difficulty in deciding the location of a petrochemical complex for naphtha-cracking due to the intensive opposition by civic pressure groups. Many government agencies receive enormous pressures in locating waste dumping grounds because of the so-called "nimby" attitude. At this stage, the managements of corporations should be fully versed in environmental regulations and levels of compliance. Any laxity in this effort would easily end up with incarcerations of not only environmental officers but of the highest corporate managers as well. We find frequently that corporations decide to bypass the environmental regulations by simply closing down existing plants or scrapping some of their investment plans, thereby compromising the goal of growth. This is indeed the stage of exaggerated claims and rising pressures. The corporations under gunpoint barely manage to comply with the demands of the existing laws and regulations.

The **third stage** is where the corporations finally join with these leading initiatives of the public sector and start to take initiatives in environmental protection ahead of the existing laws and controls. Companies which fall into this category are Dow, ICI, Ciba Geigy, Bayer and Chevron, etc. The fact that these companies are invariably petroleum or petrochemical companies is not a coincidence. The large-scale explosion of petrochemical plants and huge oil spills all around the world have made these industries very unpopular

among the general public. Frequently the image of these industries is seen as dangerous, dirty, environmentally detrimental, and not absolutely necessary. The fact that these impressions are not necessarily based on fact is of little consequence because, however erroneous the public perception may be, it is the reality with which these corporations must live or die. Many insiders are continuously concerned about the very existence of these industries in their present form. As a natural result, they have devoted an extraordinary amount of time, energy and resources not only to improving their corporate and industrial images but to becoming actually eco-friendly and eco efficient. The Bayer Corporation, for instance, spends 20 per cent of its manufacturing costs on environmental protection. Du Pont eliminated 60 per cent of emissions of air-polluting elements by 1993, and is planning to eliminate 90 per cent of emissions of carcinogenic elements by the year 2000. Most of these companies apply strict intra-company environmental rules to their subsidiaries and investments in less developed nations around the world. By now it has become common sense in the industry that eco-efficient management is beneficial to the bottom line and that waste reduction always pays.

Among east Asian countries companies falling into this category are extremely rare, with the exception of some in Japan. It is with great honour and pride I report that my company, Samsung Petrochemical Co., falls into this category. Korean government regulations require carbon monoxide emission to be less than 300 ppm, whereas our actual emission is 30 ppm; dust emission should be less than 50 mg/m^3 but ours is 5 ppm; SO_x should be less than 540 ppm but ours is below 1 ppm. In wastewater effluent, COD should be less than 90 ppm but ours is 15 ppm; BOD should be less than 80 ppm but ours is 13 ppm; and suspended solids should be less than 80 ppm but ours is 10 ppm. By installing sensing devices operating 24 hours a day, which relay the data to tele-metering systems in our office and at local government control centres, at both air emission and wastewater emission points, we are in full control of our environmental protection. These sensors are designed to automatically cut off the flow of treated water as soon as any pollution is detected, and the water is automatically sent back for re-treatment. This way we ensure that our treated waste water is 100 per cent pollution free. Our heating oil furnace has been fully converted from the old oil-burning type to use only clean liquefied natural gas. We extend our environmental and safety compliance review service to our supplier companies and customer companies free of charge. In our company we regard environmentally friendly management as the basis upon which our company exists.

The **fourth stage** of eco-efficient management is the stage where eco-efficiency becomes the primary decision-making rule in every aspect of corporate management. At this stage, considerations of eco-efficiency are introduced from the cradle to the grave of any product life-cycle. It has become industry common sense that pollution prevention and eco-efficiency introduced from the product design and plant design stage will save total manufacturing cost by as much as 50 per cent compared to the elimination of environmental pollution by adding new facilities and new devices in old style of plants. A continuous corporation-wide campaign is conducted to use less materials, to use less energy, to generate less effluents, and in general to reduce the total size of throughput at every stage of management from product planning all the way to sales, delivery and after-sale service. Even office-type activities can be screened through the sieve of eco-efficiency. Primary decision-making on the allocation of investment resources is fully utilized in order to improve eco-efficiency. This is an innovative stage where all the creative energies and minds of corporate management are channeled toward increasing ecological efficiency in our general management activities. Some of the petrochemical companies quoted above, as well as 3M of America, fall into this category, but I know of no east Asian companies which fall into this category. Needless to say, the technology and the art of introducing eco-efficiency into every aspect of management is something which advanced corporations should be willing to share with companies in other parts of the world if they are truly serious about protecting the environment which we all share no matter where we live.

The **fifth and final stage** is still a stage of theoretical considerations, and I know of no eastern or western corporations which actually fall into this category. This is the stage where the costs of environmental pollution and depletion of limited resources are internalized in the management accounting of corporate activities. The ecological accounting of pollution and depletion can be done in either of the following two ways. The first is the relatively unambitious way where only those costs associated with the generation of wastes, pollution emissions, and related treatment costs can be actually included in the total production costs and raises the sales price of the product as much if possible. This is done in almost all of the existing corporations to a varying degree. To the extent that market competition is less than totally free, as economists would want to say, some of these ecological costs can be shifted forward to the final consumer. However, true and proper ecological accounting should be done by assigning shadow prices for all management activities at all stages, for every activity which either (1) has pollution effects and increases treatment costs or (2) has depletion effects on the Earth's limited resources in general, such as energy, paper, rare metals, etc. whenever they are at less than the targeted level of eco-efficiency which is determined by corporate internal guidelines.

All of these costs based on theoretical shadow prices can be reflected in the final market price of the product or service. Different divisions of the corporation can be made to compete over this value of environmental cost, ecological inefficiency, and inefficient utilization of resources. However, the ultimate purpose of such ecological accounting should be to reflect the true theoretical social costs in the final product prices so that consumers will be made to pay for the total social costs associated with environmental deterioration or be discouraged from such consumption activities. To the extent that corporations compete with each other, individual corporations can be penalized for their eco-inefficiency; but unless the entire society is made to pay the costs associated with the unrestrained consumption of ecologically inefficient products and services, our competitive market economic system will never generate the correct signal needed to induce an ecologically efficient economic structure. Needless to say, this is a very complicated task. Governments should lead the competitive markets so as to generate an environmentally efficient and friendly industry structure at any level of economic development. As environmental destitution is soon going to be the ultimate question of survival for mankind, governments of the world should start focusing on this broader and proper industrial policy rather than on the simple and unfortunate issue of taxing CO_2 emissions.

IV. Conclusion

The fact remains that the east Asian countries will try to pursue continuous economic development and try to raise the consumption standards of their people as closely as possible to the level already enjoyed by the people of advanced industrial countries in Europe and North America. Considering the huge size and high growth rates of east Asian economies, environmental destruction in these newly industrializing countries will obviously be a very serious problem, not only for east Asia but for the world. Furthermore, the pattern of industrialization in east Asia is going to be repeated in other parts of Asia, perhaps in all of the rest of the world. The paradigm of economic growth set by the present advanced countries is that of industrial development first, followed by environmental rectifications next. Exactly the same pattern is now being repeated in east Asia; this time on a greater and more pervasive scale than before. As time passes, exactly the same order of priority will be applied to the industrialization of south and west Asia and of Africa.

The consolation is that at least this time the east Asian governments and corporations are keenly aware of the wrong order of priority between industrialization and environmental protection. We know that we have to shift as soon as possible from stage number two as described above toward the third and fourth stages. Unfortunately, we have neither the means nor the proper understanding of how a whole society shifts from the second stage to stages further up. East Asia has now become a very reluctant testing ground for the compatibility between industrialization and eco-efficiency. Thus far the evidence shows that the wrong paradigm of industrialization-first-and-eco-efficiency-next is not faltering at all. Environmental protection at the present level of technology still remains an expensive public good. However, as the rest of the Third World joins in the circle of prosperity, we must come up with an alternative and effective growth paradigm soon. ◆

APO's efforts for sustainable development of the environment

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Abstract
The Asian Productivity Organization (APO) promotes sustainable socio-economic development at all levels in agriculture, industry and the service sectors in the Asia and Pacific region. APO seeks to achieve environmentally sound operation at a factory/farm level by organizing demonstration projects whose aim is to show that products and services can be profitably produced through the application of clean technology, particularly in small and medium-sized enterprises.

Résumé
L'Organisation asiatique pour la productivité (APO) favorise le développement socio-économique durable à tous les niveaux des activités agricoles, industrielles et des services, dans la zone Asie et Pacifique. Elle s'efforce d'instaurer une exploitation respectueuse de l'environnement dans les usines et les exploitations agricoles en mettant sur pied des projets destinés à démontrer qu'il est possible de produire des biens et des services de façon rentable tout en recourant aux technologies propres et ce, particulièrement dans les PME-PMI.

Resumen
La Organización de Productividad de Asia (APO) promueve un desarrollo socio-económico sostenido en todos los niveles para la agricultura, la industria y los sectores de servicios en Asia y en la región del Pacífico. La APO busca alcanzar una operación ambientalmente acertada a nivel fábricas/granjas, organizando proyectos de demostración cuyo objetivo es probar que los productos y servicios pueden ser producidos de una manera rentable a través de la aplicación de una tecnología limpia, en particular en las pequeñas y medianas empresas.

What is the Asian Productivity Organization (APO)?

Objective

APO is an intergovernmental regional organization established by Convention in 1961 to increase productivity for balanced socio-economic development in the Asia and Pacific region through mutual cooperation. It is non-political, non-profit making and non-discriminatory in character.

Organization

The supreme organ of APO is the Governing Body composed of APO Directors designated by the respective member governments. The Secretariat, based in Tokyo, comprises the Secretary-General and Secretariat staff, who execute the annual programs approved by the Governing Body. The unique feature of APO is its operational networking mechanism established with the National Productivity Organizations (NPOs), which are designated by the respective member governments. NPOs act as implementing agencies for APO programs in member countries.

Roles and scope of its activities

APO aims to realize its objective by performing the roles of think-tank, catalyst, regional adviser, institution builder, and clearing house of information for productivity improvement. Its programs cover industry, service and agriculture sectors. In its activities, APO emphasizes human resource development, with such thrust areas as quality management, information technology, environment management and sustainable agricultural development.

Membership

Membership is open to the Asia-Pacific governments that are members of the Economic and Social Commission for Asia and Pacific (ESCAP) of the United Nations. The current membership comprises 18 states, namely, Bangladesh, People's Republic of China, Fiji, Hong Kong, India, Indonesia, Islamic Republic of Iran, Japan, Republic of Korea, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Socialist Republic of Vietnam.

It may be noted that these 18 member states of APO embrace 33% of the total population of the world, employ 31% of the total labor force of the world and contribute 24% of the total GDP of the world (as of 1994).

The concept of productivity

In the wake of ever-increasing recognition of importance of issues relating to the sustainable socio-economic development, "productivity" has emerged as a more dynamic and multidimensional concept that needs to be framed in the context in which it is employed. The classic idea of productivity as a relationship between input and output, ever since it was introduced during the 18th century, has been continuously reinterpreted to make it relevant to the changing social and economic environment. Initially, it emphasized the efficient use of resources, particularly labor and capital for increasing or maintaining production levels. And many continue to perceive it that way. In an era of constant changes, intangible inputs like knowledge and information have assumed added importance because of their vital role in inducing innovations. In this regard, development of human resources, including such factors as their capability, attitude and motivation is to be accorded top priority.

However, with increasing liberalization of economies around the globe, heightening societal concerns for better standard of living and pressing needs for protecting and improving the environment, the conventional input-oriented concept of productivity alone serves limited purposes. More than the inputs, nature and quality of products and services being made available to consumers have become important because of their impact on the society. Products and services which would give rise to negative impact on the social, economic and physical environments should be considered as of low productivity. Products and services to be designed and produced should not only satisfy functional and aesthetic needs of customers but should also generate low or no waste in their manufacture, use and disposal. The emphasis, therefore, should be placed on reducing life cycle costs by designing reusable and recyclable products. The basic purpose of the productivity endeavor is to seek to achieve better quality of life. To achieve higher quality of life, it must take into account all factors that affect our well-being and surrounding conditions. Furthermore, experience has shown that low productivity of social and public services sectors causes negative impact on industrial productivity and quality of life.

The scope of the productivity movement is thus being broadened to bring these vital sectors into its ambit. APO is therefore doing its utmost in promoting a holistic and comprehensive approach toward evolving productivity movement that satisfies the needs and requirements of all stakeholders in the public and private sectors for improving quality of life and, in particular, quality of working life.

With reference to the environmental dimension, APO is trying to contribute to its betterment with the concept of "Green Productivity", as the importance of productivity improvement in this area cannot be overemphasized.

The Green Productivity movement

In order to pursue the socioeconomic development of the world without destroying the environment, it is imperative to adopt a new paradigm wherein the relationship between productivity improvement and environmental preservation is not treated as a trade-off but as a harmonious one for the survival and prosperity of mankind. The concept of **Green Productivity** has thus been developed, aiming at instituting cleaner production systems in the process of increasing overall productivity, in due recognition of the fact that environmental problems are the cumulative result of negative impact exerted on the globe over the years by business entities at their production sites and also by people in their daily lives. Continuing deterioration of the environment will be detrimental to people's health and welfare and eventually have a devastating effect on human civilization. For the Green Productivity movement to be successful, all efforts will have to be pooled by calling for mutual cooperation at transnational and global levels.

Since its inception in 1961, APO has been undertaking a wide range of programs focusing on productivity improvement at a micro level in close coordination with the National Productivity Organizations (NPOs) in member countries. APO believes that one of the most effective means of promoting Green Productivity practices is to start from the production site of an enterprise, extending it to other enterprises in the community and then to industry with the active support of government and society as a whole. Under this policy direction, APO has now stepped forward to promote Green Productivity through its strong linkages with enterprises under the APO-NPO network fostered over thirty years. With a view to formulating concrete measures and actions for the Green Productivity movement, APO has instituted a new program called **Special Program for Environment (SPE)** with a special fund provided by the Japanese Government.

The Special Program for Environment

Measures taken by factories and farms in the region are, by and large, far from satisfactory for solving environmental problems in spite of ever growing public awareness of the issue. The main reasons for this are due probably to unfamiliarity with available technologies, high costs of technology and equipment for environmental protection and improvement, and lack of environmental engineers and consultants. This problematic situation was analyzed through the APO's Basic Research VII on Productivity and Environment which was conducted for two years from 1993 to 1994.

To cope with the pressing needs for environment protection in member countries, APO started in 1994 a Special Program for Environment (SPE) to study and recommend future activities to be undertaken by APO and NPOs in order to achieve sustainable development in the region by strengthening NPOs' consulting capabilities on environment, and establishing an international network of cooperation with universities, R&D institutes, industries, and other relevant organizations within and outside the APO region.

In 1995 an **Office for Environment** was established within the APO Secretariat to coordinate all programs and activities of APO relating to environment. A special **Committee on Environment (COE)** consisting of several experts selected from APO member countries was formed to function as an advisory body to the APO Secretariat for planning and implementing activities under the Special Program for Environment.

Among several activities on environment, the following two are given a high priority to start with:

Demonstration Factory/Farm Project (DFP)

In 1995, APO launched the Demonstration Factory/Farm Project (DFP) at four enterprises engaged in printing (China), electro-plating (Thailand), metal coating (Hong Kong) and textile dyes and dye intermediates manufacturing (India). This project aims to empirically substantiate that environmental protection and productivity improvement could be profitably harmonized, especially in small and medium businesses, and to help further promote the establishment of environment-friendly factories and farms in APO member countries.

DFP is designed to cater to the needs of local industries for their sustainability. It emphasizes adoption of cleaner production, wherever technically and economically feasible, with an ultimate goal of enhancing their competitiveness through efficient use of energy and materials, and waste reduction. In this process, conventional end of pipe technologies may be considered as transitional and practicable measures.

The results achieved by DFP will be widely disseminated by APO, through publication of documents and audio-visuals, organizing of workshop meetings and seminars, sponsoring of observational study missions, etc. To this end, DFP is implemented through close mutual cooperation among the APO Secretariat, NPOs, participating factories and farms, and local agencies concerned.

APO World Conference on Green Productivity

APO is organizing the World Conference on Green Productivity from 4 to 6 December 1996 in Manila, the Philippines, in collaboration with the Development Academy of the Philippines.

Keeping in view the global interests in the environment and the on-going activities of APO, this Conference will discuss, inter alia, concrete measures to materialize a harmony between business activities and the environment under the concept of **Green Productivity**. It will also try to clarify the roles to be played by NPOs, industries, and international agencies including the APO in order to achieve harmony and to map out action plans for implementation. The findings of the DFP at the above mentioned four enterprises will also be presented by the respective top management. The Conference is designed to provide a forum for discussion with and among representatives from international organizations, government officials, top management, senior engineers, union leaders, academia, the mass media and NGOs.

Asia-Pacific: a key region for sustainable development

It has now been four years since the nations of the world agreed at the Rio Earth Summit that sustainability must be the basic direction for overall development. The new millennium is dawning in another four years. At this juncture, it is considered very opportune for the people of the Asia-Pacific region as well as those from other parts of the world to meet at the aforementioned APO World Conference on Green Productivity in Manila, deliberate once again the message of the Rio Summit, and work out concrete action plans for sustainable development at the global level.

There are strong calls for realization of the spirit of the Rio Earth Summit which are to be responded to, in a concrete manner, especially in the Asia-Pacific region. The Asia-Pacific region is home to approximately 3.7 billion people – over 60% of the global population. The Asia-Pacific region has been achieving striking economic growth. How the region deals with agricultural and industrial development is bound to have a major impact not only on the regional environment but also on the whole of the global environment. Indeed, there are already signs that rampant development has been a major cause of environmental degradation and destruction.

Promotion of sustainable industrial and agricultural development with concrete measures in the Asia-Pacific countries will not only contribute to forestalling global environmental degradation but will also serve as an important model for the other countries in the world.

Rapid urbanization and industrialization taking place in Asian countries is an engine for their further economic development and has contributed so far to building up the increased capability for accommodating their rapidly growing populations, in terms of employment opportunities and development of infrastructure and services. At the same time, however, such urbanization and industrialization has given rise to deleterious impacts on the health and sanitation of the region. For instance, indiscriminate use of energy resources in the industrial, transport, and residential sectors has already caused a negative impact on the global environment as seen in acid rain, global warming, desertification and other problems. It is thus essential that pragmatic measures for sustainable development be taken for industrialization in the Asian countries to enable them to cope with their rapidly growing populations without adversely affecting the environment.

When one looks at the agricultural development in Asia, there is no gainsaying that the Green Revolution made it possible to dramatically increase food production and has been an im-

portant factor in the growth in world population. At the same time, however, the massive use of chemical fertilizers, pesticides and fungicides, irrigation, and other technologies has caused soil deterioration, residual pollution of food supplies, loss of water resources and other problems, and agriculture has consequently come to be less sustainable. Further, a sharp increase is expected in the consumption of food in Asia, owing to growing populations coupled with changes in their dietary habits. This calls for urgent action to enhance agriculture's sustainability along with increasing production of food.

In promoting sustainable agricultural and industrial development, it is essential that measures for cleaner production or green productivity be planned and implemented at each work site in an organized manner. For this purpose, a macro-economic plan on national development policies including those for global trading structures and systems would first have to be established, on one hand, and practical approaches for implementation of such policies at a micro-economic level be mapped out, on the other, so as to positively support and help the promoters and practitioners at a work site to succeed in their endeavors for green productivity activities.

In view of the above, APO considers it vital that the countries of the Asia-Pacific region, the enterprises that work in the region, the people who live there, the concerned international agencies and NGOs clearly realize the strategic importance of their efforts for environmental sustainability vis-à-vis the global development.

In search of global partnership

As aforementioned, APO seeks to achieve environmentally sustainable development through human resources development in its member countries. It is a constant search for a better quality of life for all in the APO region. By means of the networking machinery established with NPOs in the respective member countries, APO is striving in earnest to inculcate a critical mass in the region on the ways and means for application of cleaner production systems or green productivity technology. In this respect, two sets of critical masses in particular may be addressed: one set is the small and medium-sized enterprises (SMEs) engaged in manufacturing and services activities and the other set is consumers at large.

The importance of SMEs to socio-economic development needs no reiteration, considering the number of their establishments, the labor force employed by them and their contributions to the respective GDPs. Judging from their involvement in supply of raw materials, manufacturing processes, physical distribution of products, post-sale follow-up services for customers/consumers, etc., the roles to be played by SMEs would have tremendous impact on environmental protection and improvement.

For sustainable development, organic flow of their activities linked with the above illustrative functions, needless to say, is of crucial importance in terms of exploitation of natural resources, waste minimization and recycling, adoption of cleaner production processes, just to mention a few.

SMEs, like other business entities, will have to be profit-oriented and, at the same time, to be socially accountable for their products and services. As compared to large business concerns or industries, SMEs in general are admittedly situated in less advantageous and less privileged positions in terms of financial and technological capabilities of their own, access to government support, networking with outsiders for technical information and assistance, etc. In view of the above, SMEs are all the more in need of guidance and cooperation intra-nationally as well as internationally, especially when it comes to the issues and problems of environmental preservation and improvement.

The experience of APO attests that a good deal of productivity improvement of SMEs could be achieved, in terms of managerial capability and manufacturing processes including environmental dimensions, by means of simple "better housekeeping" techniques known as "5S's" in the East and "step-by-step" improvement programs like "KAIZEN". The ongoing APO Demonstration Factory/Farm Project (DFP) on CP or Green Productivity also testifies that a good deal of environmental improvement has been made through human ingenuity and devices without involving much financial outlay.

As earlier mentioned in this paper, APO attempts to disseminate as widely as possible the results (success and failure) of DFP and other environment-related programs through documentation (manuals and guides), audio-visual and other multi-media aids by organizing symposia, seminars and workshop meetings. Commonplace as it may sound, APO hopes to act as a clearing house of information on the basis of the findings of APO programs. However, APO's efforts in this direction alone would not suffice to meet the needs and requirements of its member countries, not to speak of the global demand. Here lies an absolute necessity to tap and pool all the knowledge, information and wisdom accumulated by national, regional and international organizations devoted to sustainable development in order to take care of the demands of SMEs in particular. The initiatives being taken by UNEP IE for setting up and guiding the National Cleaner Production Centres (NCPCs) are producing remarkable results, of which the best advantage would have to be taken by the parties concerned. As global interdependence intensifies, more vigorous efforts must be made for timely flow and exchange of information for the benefit of business entities. The role to be played by international agencies will be indispensable and the modus operandi for this purpose will have to be jointly worked out.

Another set of critical mass to be given due attention would be the end-users of products and services, namely, the customers/consumers at large. In effect, they are the stakeholders, as far as the environment is concerned, because its degradation or improvement will have direct or indirect bearing on their quality of life. In order to satisfy the interest and the needs of the "stakeholders", the foregoing discussion in this paper indicated that "products and services to be designed and produced should generate low or no waste in their manufacture, use and disposal" and further that "the emphasis should be placed on reducing life-cycle costs by designing reusable and recyclable products". With a view to materializing this, the consumers as end-users should be able to provide the manufacturers and suppliers, who are also consumers in one way or the other, the right kind of feed-back on the desirable products and services they require. For this purpose, the consumers' awareness will have to be developed and nurtured on the requirements of their daily life for environmental preservation and improvement, so that a "consumer-driven" campaign for environmentally sustainable development can be evolved for the benefit of all. While no one would disagree on this point, how to put into practice is, admittedly, easier said than done. Nevertheless, this is one of the crucial areas needing concerted efforts and assistance of international organizations through their mutual cooperation. APO is certainly determined to share its responsibility by exerting itself toward this end. ◆

Beyond demonstration of cleaner production – fostering a new industrial approach

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In 1993, the Second National Conference on Industrial Pollution Prevention and Control, co-sponsored by China's National Environmental Protection Agency (NEPA) and the State Economic and Trade Commission (SETC), identified cleaner production as a major element in the country's strategy for prevention and control of industrial pollution, throughout the 1990s and into the 21st century.

Over the past few years, NEPA has been actively and consistently promoting cleaner production, focusing on:

- reinforcement of training to promote changes in the perception of industrial pollution prevention and control;
- implementation of technical procedures to allow industries to practise cleaner production;
- cleaner production pilot projects, including the setting up of a group of demonstration companies;
- recommendations for reform and modification of current policies and rules for environmental management, to encourage cleaner production in China.

NEPA has promoted cleaner production through the implementation of a cleaner production project, funded by the World Bank and involving pilot work in 27 companies from different sectors of industry. The project has yielded positive results: most of the cleaner production options identified in cleaner production audits have proved profitable; companies have upgraded their level of management through implementation of low-cost or no-cost options; they have opted for cleaner production as a way of achieving environmental protection and company development; and they have become more aware of the value of cleaner production in both upgrading their environmental image and increasing the competitiveness of their products on national and international markets.

China has its own team of technical personnel for cleaner production and has established a trans-sector and trans-region network. A National Cleaner Production Centre, co-funded by UNIDO and UNEP, has also been founded, procedures and guidelines worked out, and new demonstration projects set up.

The main lessons learned from past experience with cleaner production are:

- Cleaner production will be a future trend in pollution prevention. It has been shown that this approach can reverse the trends of current models of economic development, which result in the consumption of excessive amounts of resources and energy and in pollution on a massive scale.

- Since cleaner production affects almost every aspect of a company's operations, awareness on the part of all company decision-makers is vital if it is to be adopted.
- Training and improvements in management and operating practices are key fac-tors for the implementation of cleaner production policies.
- Current environmental management systems use "end-of-pipe" solutions. This focus is very different from that of cleaner production. Policies and rules concerning environmental management must be changed if cleaner production is to be implemented effectively.

This is the first year of China's ninth five-year plan. The plan calls for a fundamental shift from an extensive economic growth model to an intensive economic growth pattern. To help bring about this transition, NEPA has proposed environmental goals for China for the last five years of this century. In particular, two significant measures have been outlined which could help make it possible. The first is a change from concentration-based to mass- or volume-based environmental standards; the second is the implemen- tation of China's Trans-Century Green Engineering Programme. NEPA has also proposed a three-step master plan for implementation of cleaner production over the next five years:

1) A model for economic development based on intensive use of resources through cleaner production will be explored.

2) Companies will be encouraged to seek economic benefits from maximized use of resources and energy, and to lower pollution emissions, by adopting cleaner production techniques.

3) Efforts will be made to formulate a new economic policy encouraging cleaner production, so as to lay solid foundations for wider dissemination and deeper penetration of the cleaner production approach over the next five to ten years.

Promotion of cleaner production has involved various sectors of industry and all of China's regions. A variety of other factors such as the assimilation of ideas and concepts, technical procedures, accounting, design regulation, company management, improvement of production processes, and the use of evaluation standards and of laws and policies, are also involved. There is therefore a need for close cooperation between all relevant departments and people if cleaner production is to fulfil its potential as catalyst on the road to sustainable development of Chinese industry.

Promoting cleaner production in Thailand: integrating cleaner production into ISO 14001 Environmental Management Systems

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Abstract

Cleaner production programmes and Environmental Management Systems, of which the ISO 14000 EMS series will be the international standard, have been identified as potentially powerful instruments for promoting pollution abatement in Thai industry. This article examines both the cleaner production approach and the ISO 14001 EMS approach to determine possible relationships between the two, as well as the potential impact of ISO 14001 on the promotion of cleaner production in Thailand.

Résumé

Les programmes de production plus propre et les systèmes de gestion environnementale, dont la série EMS de l'ISO 14000 constituera la norme internationale, ont été reconnus comme des instruments à fort potentiel pour promoouvoir la lutte contre la pollution dans l'industrie thaïlandaise. Cet article examine la démarche de production plus propre adoptée et l'approche des systèmes de gestion environnementale de la norme internationale ISO 14001, afin de déterminer les rapports éventuels entre les deux ainsi que l'impact possible de cette norme pour promouvoir la production plus propre en Thaïlande.

Resumen

Los programas de la producción más limpia y los Sistemas de Gestión del Medio Ambiente, de los cuales la serie ISO 14000 EMS será la norma internacional, han sido identificados como instrumentos potencialmente convincentes para promocionar la disminución de la contaminación en la industria tailandesa. Este artículo examina tanto el acercamiento a la producción más limpia como el enfoque de la ISO 14001 EMS para determinar las posibles relaciones entre ambos, así como el impacto potencial de la ISO 14001 en la promoción de la producción más limpia en Tailandia.

Current state of Thai industry and environment

Over the last decade the Thai economy has continued a pattern of growth initiated in the early 1960s, resulting in overall Gross National Product (GNP) growth in excess of 8 percent per year for the period. Economic growth has been driven by substantial expansion of both domestic and export markets. Review of industrial growth indicates the majority of increased GNP can be attributed to the rapidly expanding industrial and agro-industrial sectors (NESDB, 1996. The high activity of the manufacturing and agro industry sectors together has put a severe stain on Thailand's infrastructure and resources and raised increasing concerns about environmental problems related to generation, treatment and/or disposal of hazardous waste, toxic waste, untreated or poorly treated industrial wastewater, solid industrial waste, and air pollution generated by industrial activities.

The rapid growth of the manufacturing and agro industrial sectors has resulted in a correspondingly rapid expansion in the number of factories operating in Thailand. The Department of Industrial Works records indicate a total of 103,574 factories were registered in 1994. Of these, almost 60% are estimated to be household enterprises having less than 10 employees, approximately 40% are estimated to be small to medium scale enterprises (SMEs) having less than 200 employees, and less than one percent are estimated to be large scale industries (DIW, 1994).

Over the last two decades, Thailand has enacted a wide range of legislation aimed at controlling pollution. In total, Thai environmental legislation is quite comprehensive, covering all aspects of pollution control, including that for soil, water and air pollution as well as hazardous waste handling and disposal. However, existing legislation has had little effect in controlling pollution outputs. The ineffectiveness of Thai environmental legislation can be attributed to several factors. While the weak enforcement of Thai environmental law is most often cited as the major reason such laws are ineffective, the poor enforcement is itself a result of a combination of other conditions.

In Thailand, as in other developing nations, SMEs account for a significant portion of employment, as well as economic growth. The number of SMEs operating in Thailand has increased substantially in the last decade, both as a cause and effect of economic growth. The vast majority of new SMEs have located in the Bangkok Metropolitan Region, substantially increasing pollution loads to receiving soil, water and air, resulting in increasingly severe environmental impacts. However, regulations controlling siting of factories and pollution effluents have had little effect in controlling both the increase in the number of heavily polluting SMEs and their pollution outputs. Pollution control requirements are often left unenforced due to concerns such enforcement will financially burden SMEs and result in reduced economic growth with correspondingly higher inflation and unemployment. Furthermore, government agencies responsible for issuing operating permits and inspecting facilities have been understaffed and unable to keep up with the increasing workloads resulting from the expanding industrial base. Many newer factories, especially SMEs, open and operate without obtaining the proper operating and effluent discharge permits.

Following the pattern of industrial growth and coupled with the relative lack of enforcement of environmental regulations, overall levels of pollution in Thailand have been increasing rapidly. Major problem areas include surface and ground water pollution, soil pollution, air pollution, and pollution resulting from inadequate or improper disposal of solid and hazardous wastes. Of major concern are the effects of high levels of water and demonstration projects. Long-term sustainability has been quite low. Overall, participating industries have failed to incorporate the auditing, evaluation and management techniques inherent in a sustainable in-house cleaner production program, instead utilizing cleaner production as a one-time improvement tool rather than a tool for continual improvement. While the project was successful in terms of spreading application-specific cleaner technologies among other industries in the target sectors, such as computerized color matching in

textile dyeing factories, the broader scope of cleaner production activities failed to become self-promoting within the targeted sectors.

To date, the other cleaner production initiatives attempted in Thailand have experienced moderate to high success in promoting the adoption of specific cleaner technologies by participating industries in the targeted sectors. These initiatives have focused on the hard to reach SMEs, introducing cleaner production concepts to participants. However, like the IEM project, these initiatives have failed to achieve the self-promoting, sustainable results necessary to spread cleaner production principles across industrial sectors. The sustainability of cleaner production among SMEs is further reduced due to the limited technical resources available to the industries.

More recently, the Thailand Environment Institute (TEI) began initial operation of a five-year project to promote cleaner production in Thai SMEs. The project, funded by DANCED for an initial two-year phase, focuses on SMEs operating in the food processing and electroplating sectors and is a complement program to the CP promotion program operating under IEM at FTI. The TEI project includes a series of CP training workshops for industry representatives, several CP demonstration projects, CP audits of participating industries, and establishment of a CP Information Center. The long-term project goal is to establish cleaner production as a sustainable activity carried out by industry in response to its environmental outputs through an integration of training activities, hands-on auditing and problem solving, demonstration projects and information services. However, given the success of past efforts focusing on SMEs, cleaner production promotion efforts are likely to remain unsustainable without additional incentives to industry.

ISO 14000 and EMS-related activities in Thailand

Voluntary industrial standards incorporating environmental management systems have begun spreading from the developed nations to the developing and newly industrialized nations, including Thailand. This rapid spread of voluntary standards has recently been given a boost by the development of the ISO 14001 standard by the International Organization for Standardization (ISO). The ISO 14001 standard is structured around the concept of a company developed, implemented and maintained EMS, supported by a company's commitment to comply with relevant environmental regulations and manage environmental impacts.

Thailand has been developing institutional support for ISO 14000 through a variety of government, NGO and private sector initiatives. Initiatives undertaken so far include establishing a Thai ISO 14000 accreditation body at the Thai government's Nation Accreditation Council, establishing ISO certification bodies at both the Thailand Industrial Standards Institute (TISI) and at the Thailand Environment Institute, and establishing ISO 14000 consulting service providers through the Thailand Productivity Institute and through services being developed by other NGOs and private enterprise.

Recently, the Thailand Environment Institute initiated a pilot ISO 14000 Project assisting ten participating companies assess, plan and implement environmental management systems for purposes of certifying to the ISO 14001 standard. The project involves several of the largest industries operating in Thailand from several sectors. The objective of the project is both to promote future ISO 14001 certification among a wider range of industries and to develop the resources necessary to meet future industry needs for ISO 14000 related services. The long-term goal is to supplement existing environmental protection mechanisms with industry participation in the voluntary ISO 14000 standards. Similarly, TISI, in conjunction with the Federation of Thai Industries, has initiated a similar ISO 14000 pilot project targeting ten FTI member companies.

Thai industrial interest in ISO 14000 has thus far been driven by several factors, including environmental awareness of the company, desirability of an environmentally-friendly image, familiarity and acceptance of the ISO 9000 standard, and desire to maintain competitiveness in export markets where environment related factors may affect business opportunities. Industry interest in ISO 14000 is expected to be highest among medium to large-scale manufacturing industries. Such industries tend to have better access to both the financial resources and the skilled personnel necessary for developing, implementing and maintaining an ISO 14000-certified EMS. Interest among small and medium-scale manufacturing industries is expected to grow, particularly if export market opportunities become more favorable for products produced by ISO 14000-certified operations.

Overall interest in ISO 14000 is expected to include not only manufacturing industries, but also service sector industries such as commercial banking. Tourism related service industries, including hotels and transportation services, are likely to consider certification in an effort to minimize the environmental impacts of their operations, particularly in areas dependent on increasingly environmentally conscious foreign tourists. A by-product should be promotion and enhancement of environmentally sustainable tourism.

Cleaner production and ISO 14000: relating the two approaches

Over the last decade, efforts of developed countries to reduce the environmental impacts resulting from industrial operations and services have been changing focus. Governmental promotion of traditional command and control approaches, such as end-of-pipe treatment, has been reduced in favor of waste minimization and other cleaner production approaches. Similarly, the wait and see attitude of many industries regarding environmental regulations and pollution effluents has been gradually moving towards the more proactive approaches available through application of ISO 14000 and other EMS structures. In general, these movements towards proactive management of environmental impacts by both government and industry have signaled an increasing awareness of environmental impacts, but also a changing understanding of costs related to producing, handling and treating production wastes. The economics of the former push for end of-pipe treatment are being re-evaluated in favor of more comprehensive management of the entire production process and resulting waste streams.

The cleaner production approach

With a focus on reducing the volumes and toxicity of all emissions and wastes streams, rather than treating emissions and wastes to reduce toxicity and environmental impacts, cleaner production differs substantially from end of-pipe treatment as a mechanism for protecting the environment and human health. While the pollution prevention concept forms the foundation of cleaner production, cleaner production expands the concept to include the entire system of inputs, processes and outputs involved in a production or service activity. As such, the cleaner production approach combines evaluation of production processes, products, and services into an integrated preventive environmental strategy. Cleaner production focuses on reducing the quantity and toxicity of emissions and wastes, as well as on conserving energy and raw material inputs, eliminating use of toxic raw materials, reducing unfavorable environmental impacts of a product's lifecycle, and reducing the environmental impacts resulting from design and provision of services (UNEP, 1994).

To be proactive, a system must be able to identify and evaluate potential future conditions that would have a negative impact on the system, then plan for conditions before they occur to ensure the system is able to manage the conditions. In cases where the conditions being managed are not static, the process of identification, evaluation and implementation of conditions must be ongoing to remain proactive. Therefore, as a proactive approach to managing environmental impacts of production or service operations, cleaner production includes the element of continuous application. This process of continuous review of the system, and identification, evaluation and implementation of new solutions separates the cleaner production approach from the more traditional reactive approach of waste and effluent treatment. As a result of its inclusion of continuous review and adjustment, cleaner production promotes increasingly more sustainable use of resources.

The ISO 14000 EMS approach

The environmental regulations of most countries are intended to ensure pollution effluents do not exceed a maximum threshold value, so as to limit the level of negative impacts of operations and waste effluents on the environment and human health. The ISO 14001 standard is intended to supplement the regulatory based environmental management practices required of manufacturing and service industries by promoting proactive identification and management of company activities impacting the environment. Based on

implementation of a company specific EMS, the voluntary standard requires a company to include the following commitments in the company environmental policy, and on which its EMS is based, in order to meet criteria necessary for certification to the standard:

- a commitment to comply with relevant environmental legislation and regulations and with other requirements to which the organization subscribes; and
- a commitment to continual environmental improvement and Prevention of Pollution (ISO, 1996).

Requiring a commitment to comply with environmental regulations indicates that an ISO 14001-certifiable EMS must include management procedures intended to attain and maintain compliance with relevant environmental regulations as a demonstration of a company's commitment to comply. Any company EMS achieving ISO 14001 certification should as a minimum therefore have procedures to both identify and comply with relevant environmental regulations. However, given the required commitments to both continual improvement of the EMS and to pollution prevention, merely instituting procedures to maintain compliance with environmental regulations is not likely to meet ISO 14001 certification requirements over the long term. Therefore, companies attempting to obtain or maintain certification are necessarily going to need to include pollution prevention and other proactive environmental management mechanisms as an integral part of their ISO 14001 EMS.

In general, the ISO 14001 clause requiring a company environmental policy and its EMS to show commitment to continual development ensures the EMS is reviewed and updated to address changing environmental conditions: changing processes, products and services; changing significance of environmental impacts; advances in process, technologies and pollution prevention and control technologies; and changing economic conditions affecting the ability of the company to implement environmental management strategies.

It is through the continual review and improvement of the EMS that ISO 14001 promotes adoption of proactive mechanisms to manage environmental impacts. Furthermore, it can be argued that the environmental value of ISO 14001 is not in its promotion of an EMS that targets continuous environmental compliance, but rather in its promotion of company self-regulation through continuous review of objectives, targets and procedures aimed at preventing environmental impacts, either to a standard more stringent than law or for impacts not regulated by environmental law. With such an interpretation of the standard, ISO 14001 promotes voluntary institutionalization of proactive environmental management mechanisms.

Relating the two approaches

Cleaner production and, more recently, ISO 14001 have become the most widely recognized alternatives to the traditional command-and-control environmental protection mechanisms. At first inspection each approach seems quite similar, with overlap in concept or implementation. However, regardless of the conceptual structures of each approach, it is the practical application of each approach that will determine its success and, ultimately, its effectiveness. Key to practical implementation are the management elements and assessment elements included in each approach.

Management support

While no company is likely to initiate a cleaner production program or an ISO 14001 EMS program without the authorization of top management, the continued involvement and support of top management is necessary to ensure success of either approach. Applying cleaner production within a company requires a high level of involvement of the company management and its staff, due to the complex and integrated nature of cleaner production evaluations and solution implementation. The continual process of review needed to sustain a cleaner production program requires the support of the top management, particularly in cases where capital purchases, equipment installation outages and start-up trials, and product changes are determined to be appropriate. Without the support of top management a cleaner production program can be implemented, but is not likely to be maintained, in effect making the process a one-time initiative. Therefore, commitment of top management to the cleaner production program is a cornerstone on which a sustainable program is built. However, given the lack of formalized review and reporting structures within the cleaner production framework, little internal support exists to assure the involvement of top management in review and improvement processes intended to sustain a cleaner production program, though a company may choose to include such structures as part of its program.

Like cleaner production, applying and maintaining a EMS within a company requires the support and periodic involvement of top management. However, unlike the cleaner production guidelines, the ISO 14001 standard includes a formalized framework to assure the involvement of top management in setting environmental policy, approving the EMS and its programs, and approving periodic reviews and improvement to the EMS. Specifically, the standard requires top management to 1) set company environmental policy; 2) appoint specific staff to be responsible for establishing, implementing, maintaining and reviewing the EMS, reporting on EMS performance to top management; and 3) periodically review the EMS to ensure its suitability and effectiveness. The provision requiring top management to actively participate, periodically review, and approve the ISO 14001 EMS provides the complete foundation of the EMS and effectively promotes review and improvement of the EMS, resulting in decreased environmental impacts over time.

Company assessment: initiating an approach

Both cleaner production and ISO 14001 require assessment of company operations to identify environmental impacts resulting from processes and services. With cleaner production, the procedures for identification of environmental impacts, generally part of the "pre-assessment" phase, provides a basis on which to identify opportunities for application of cleaner production principles. Objectives and target for the cleaner production program are generally set based on the importance of environmental impacts identified. During the audit phase, cleaner production options are evaluated based on more in-depth analysis of operational, financial and technical criteria affecting the applicability of an option. Ultimately, the viability of a cleaner production option is subject to the economic and business constraints of the company.

ISO 14001 requires environmental "effects", aspects of company activities that result in impacts to the environment, to be identified and assessed to determine which effects are significant and, therefore, require inclusion in the EMS. Similar to the pre-assessment process for identification of cleaner production opportunities, the identification of significant environmental effects leads to development of quantifiable objectives and targets. However, unlike the cleaner production approach, the ISO 14000 EMS approach also requires development and implementation of procedures, document control, monitoring, reporting and corrective action programs to manage each of the identified significant effects. While the ISO 14001 standard does not specifically require application of cleaner production principles over waste treatment principles for management of significant environmental effects, the required commitments to both pollution prevention and continual improvement strongly support utilization of cleaner production in development of programs to manage identified significant aspects.

The ISO 14001 approach for identification of environmental effects, assigning significance, and developing procedures and programs to manage the effects is capable of creating a more complete, broader-ranging response to managing environmental impacts than cleaner production alone. The EMS approach encompasses both cleaner production and end-of-pipe treatment principles, providing an integrated approach of environmental management. As the ISO 14001 standard does not specifically require inclusion of a cleaner production program, it is possible a company applying for certification or re-certification would not include cleaner production as a specific program under its EMS, even though pollution prevention activities are required under the standard. However, in order to achieve effective management of environmental impacts, an ISO 14001 EMS is likely to require an active cleaner production element. Including cleaner production as an integral part of an ISO 14001 certified EMS ensures continuous application of cleaner production principles due to the periodic auditing and EMS reviews required by the standard.

Certification of an approach

The cleaner production approach, while promoting development and utilization of internal management practices to support continual review and improvement of the system, does not require these mechanisms. Without requiring the inclusion of such management practices in an overall cleaner production program, the sustainability of the program is likely to be significantly reduced should a company choose to omit internal management practices as part of their program.

ISO 14001 differs markedly from cleaner production in terms of practical implementation of the concepts promoting continual review and improvement of the approach. Rather than relying on voluntary inclusion of internal practices to promote and manage continual review and improvement, ISO 14001 institutionalizes the practices by requiring their inclusion as a prerequisite for certification. Therefore, the certification process promotes continual review and improvement of the EMS and, hence, continually reduced environmental impacts.

Promoting cleaner production as an integral part of ISO 14001 EMS implementation

While application of cleaner production generally provides a company with a wide range of benefits beyond increased environmental performance, Thai industry has been slow, even hesitant, to adopt cleaner production. Cleaner production promotion activities have centered around NGO and government sponsored education activities and demonstration projects and have been relatively unsuccessful in achieving industry promoted adoption of cleaner production. While Thai government sponsored economic instruments would likely increase adoption of cleaner production principles, the sustainable application of cleaner production within individual companies would most probably not increase. Similar economic support schemes promoting adoption of end of pipe treatment systems have substantially increased the number of treatment systems operated by Thai industry, but done little to support correct design, operation and maintenance of the systems. Therefore, given that neither educational nor economic support for cleaner production is likely to result in its sustained adoption, other promotion instruments will be necessary. Clearly, more effective promotion activities are needed to accelerate the rate of adoption by Thai industry if cleaner production is to be an effective environmental protection mechanism. With its emphasis on continual improvement and pollution prevention, the ISO 14000 EMS standard provides an opportunity to expand industry adoption of cleaner production through promotion of CP as integral part of an ISO 14000 certifiable EMS.

The ISO 14000 standard, like its quality counterpart, is being promoted by the Thai government and private enterprise, as both a tool for environmental protection and for economic development. The steadily increasing interest in environmental matters of both industry customers and customers is likely to cause ISO 14000 certification to become a recognized indicator of environmental concern. As such, Thai companies exporting to Europe and the United States may need ISO 14000 certification to stay competitive in the marketplace.

Integrating cleaner production into ISO 14000 promotion, implementation and certification activities provides an opportunity to spread CP principles over a wider range of industries at the same time. In cases where cleaner production is an integral part of its ISO certified EMS, implementation of cleaner production solutions by company is likely to be more strongly supported as a result of the company's commitment to its environmental objectives and targets. Similarly the sustainable application of cleaner production in such a company should be enhanced as a result of the continual improvement clauses of the ISO 14001 standard.

Promoting cleaner production as an integral part of an ISO 14001 EMS may result in increased application of cleaner production by Thai SMEs. A clause in the standard requires a company EMS to include procedures and requirements related to significant environmental aspects of good and services used by the company and that the company inform the involved suppliers and contractors of these procedures and requirements in as part of ISO 14001 certification requirements ISO 1996). SMEs supplying ISO 14001 companies may be pressured to adopt environmental management mechanisms, including CP, to maintain supply contracts.

Conclusions

Under the ISO 14001 EMS standard, a certifiable EMS must include elements supporting both continual review and improvement of the system and pollution prevention activities. These requirements strongly support inclusion of cleaner production as an integral part of a ISO 14001 certifiable EMS. Promotion of cleaner production as an integral part of an ISO 14001 EMS is likely to yield a higher rate of adoption of cleaner production principles by a wider range Thai industry than approaches already tested in Thailand. Furthermore, the management structures required under the ISO 14001 standard enhance the probability that companies applying cleaner production principles as part of their EMS will continue to do so, thereby increasing the sustainability of cleaner production in Thailand.

References

1994 Official Record of Thai Industries: Department of Industrial Works, Ministry of Industry; 1994. Cleaner Production: What is Cleaner Production and the Cleaner Production Program?; UNEP Industry and Environment; pp. 4, 5; Volume 17, No. 4; October-December 1994.

Environmental Management Systems: Specifications and Guidance for Use; International Organization for Standardization; Draft International Standard ISO/DIS 14001.2; 1996.

The Thai Economy in 1995 and the Trend for 1996; National Economic and Social Development Board, December 19, 1995. ◆

Cleaner production regional perspectives: Africa region

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Abstract

This article reviews cleaner production-related activities in several African countries. Awareness creation, management commitment, changing of attitudes, and in-plant demonstrations are crucial to the successful promotion of the cleaner production concept in the region. The UNEP Regional Office for Africa (ROA), as well as other institutions and organizations, need to be increasingly active in creating opportunities for exchanging views and experiences related to cleaner production.

Résumé

Cet article examine les activités liées à la production plus propre, dans plusieurs pays d'Afrique. Elaboration de moyens de sensibilisation, engagement des dirigeants d'entreprises, changement des comportements ainsi que démonstrations dans les usines constituent des éléments cruciaux pour promouvoir efficacement le concept de production plus propre dans la région. Il est nécessaire que le Bureau régional du PNUE pour l'Afrique (ROA), mais aussi d'autres institutions et organisations, redoublent d'efforts afin de créer de nouvelles possibilités d'échanges de vues et d'expériences dans le domaine de le production plus propre.

Resumen

Este artículo analiza las actividades relacionadas con la producción más limpia en diversos países africanos. La conscienciación, el compromiso de gestión, el cambio de actitudes y las demostraciones en fábrica son cruciales para la promoción exitosa del concepto de producción más limpia en esta región. La Oficina Regional de UNEP para Africa (ROA) así como otras instituciones y organizaciones deben ser cada vez más activas con el fin de ofrecer oportunidades para el intercambio de puntos de vista y de experiencias relacionadas con la producción más limpia.

Introduction

Cleaner production activities in the region can be categorized into institutionalized, short-term projects/programmes and initiatives from the private sector firms and institutions/organizations. Over the years, since the inception of the cleaner production concept, the awareness of cleaner production has been percolating through the machinery and systems of governments, public and private enterprises, chambers of commerce and industry, public and non-governmental organizations, etc.

Most governments, after the Rio de Janeiro summit of 1992, in the course of implementing the resolutions of that conference and Agenda 21 have established National Environmental Action Plans (NEAPs). Those who did not have environmental policies and legislation went ahead to establish them; while those who had them had to review them accordingly. It is through the implementation of the NEAPs and agenda that most nations encounter cleaner production in one way or another.

This article will try to highlight the cleaner production perspective in some African countries, namely: Egypt, Ethiopia, South Africa, Tanzania, Tunisia, Zambia and Zimbabwe. It is not possible to give an overview of all cleaner production and related activities in the region in such a presentation. A thorough and an in-depth study is required for a more detailed overview.

Egypt

RAKTA is the largest pulp and article mill in Egypt which uses rice straw as the main raw material. Its production process is characterized by high levels of pollution, notably wastewater flows which are directly discharged into the sea. The total average organic pollution discharged by RAKTA was estimated to be comparable with the emissions of a town of 1.6 million inhabitants.

RAKTA has been chosen by a number of multilateral and bilateral agencies as a pilot to conduct cleaner production assessments, develop environmentally upgraded technologies, and function as a model for industries in other countries. The core project, supported by UNEP Industry and Environment (UNEP IE), has the following objectives:

- prepare an environmental audit and pollution prevention assessment of RAKTA as the main mechanism for introducing cleaner production processes;
- identify the technical, financial and socio-political constraints and opportunities for cleaner production in the pulp and paper industry;
- describe managerial approaches to cleaner production which can be duplicated elsewhere;
- identify cost-effective technological solutions to the environmental problems caused by pulp and paper production, and assess their impact and viability through EIAs;
- prepare an integral plan for the implementation of cleaner production at RAKTA, including technical, for technology transfer and investment along with sources of financing.

Initial efforts of RAKTA in applying cleaner production concepts had faced significant technical obstacles:

- methods for the chemical recovery of rice straw black liquor;
- processes for the recovery and reuse of cellulosic fibers from waters;
- reuse of effluents from the hypochlorite bleaching plant;
- reuse of waters from the wet cleaning of rice straws.

Second best end-of-pipe solutions appeared beyond the financial capacity of both RAKTA and other firms in the sector. Such difficulties have prompted other donors to support activities in related and complementary fields of cooperation.

R&D activities, financed by the German government, have now been carried out by RAKTA in collaboration with other companies, and have resulted in the design and patenting of a system for the chemical recovery of rice straw black liquor. The application of chemical recovery systems is expected to reduce RAKTA's pollution by 90 per cent, and induce savings in sodium hydroxide up to 80 per cent.

UNIDO has arranged a study tour for RAKTA managerial and technical staff to evaluate other experiences in black liquor desilication plants, and financed R&D – including demonstrations at RAKTA focused on the adaptation of existing desilication techniques.

A technical group has been established with the support of the German and Chinese governments for the study of new cooking methods to overcome the black liquor problems. The team consists of five experts from China, Germany, the United States, UNIDO, and RAKTA. The project is expected to lead to the establishment of a demonstration plant in Beijing, China.

Research on processes for the recovery and reuse of cellulosic fibers from water, and for water reuse,

is being undertaken with the financial support of USAID through the academy of Scientific Research and Technology. The research team draws from the faculty of engineering of Alexandria University, Egypt, and RAKTA's technical staff.

Additional projects are being planned by RAKTA with the aim of designing viable cleaner technology solutions for the reuse of the effluents from the hypochlorite bleaching plant, and the reuse of water from the process of wet-cleaning of rice straws.

Egypt, under the support of the US Agency for International Development (USAID) and the US Environmental Protection Agency, also participates in the Environmental Pollution Prevention Project (EP3). The in-country EP3 offices work with local industries to encourage the integration of pollution prevention measures in their manufacturing operations. The programme embraces three specific inter-related components:

- a programme of assistance to the industry designed to establish pollution prevention programmes in factories by means of pollution prevention assessments, waste minimization audits and monitoring;
- a programme of cooperation with the government, primarily aimed at strengthening institutions with a view to developing incentives for pollution prevention and cleaner production practices;
- an education, information and communication programme which creates a centre for the Exchange of Information in the field of cleaner technologies and organizes seminars workshops and training programmes for decision-makers and technical managers in the private sector and the government.

Ethiopia

The Chemical Society of Ethiopia and the Chem Tech Centre are among the most active institutions involved in the promotion of cleaner production in Ethiopia. Starting from 1992, the Chemical Society of Ethiopia has made "Chemistry and Environment" one of the four themes of the scientific session of the Society's Annual Scientific Congress, with regular presentations on the subject of environmentally sound production. The Annual Congress, at its 11th meeting in 1994, was attended by university and industry professionals, especially chemists and chemical engineers from industry.

One of the institutional goals of the Chem Tech Centre is the promotion of cleaner production in Ethiopia. The Centre believes that cleaner production is instrumental in industrial development and that technology options must be adapted to the operational realities of developing countries. To this effect, the company is engaged in research work aimed at developing a concept of cleaner technology appropriate to the Ethiopian context. Furthermore, it conducts short-term awareness seminars for managers in the chemical sector, and gives free-of-charge expert advice on a number of government initiatives. The company has designed an industrial training package on systems engineering and process auditing, which are important technical tools for the implementation of cleaner production. Preparations are underway to launch the programme also in other African countries. The Chem Tech Centre intends to make cleaner production promotion one of its areas of specialization.

South Africa

The Industrial Environmental Forum (IEF) of Southern Africa was formed in 1990 by a group of South Africa's leading business people and industrialists sharing common values that reflected a vision of the dynamic role that business should play in the protection of the environment. Their overarching goals included the following:

- to show that business was a significant force in this endeavor and part of the overall solution to environmental problems;
- to be a monitor for maintaining cost-effective and realistic targets in environmental programmes;
- to raise general awareness amongst organizations in the region and to create a network of affiliated groups committed to the belief that good business management equates comfortably with good environmental management.

Members of the IEF are committed to continuous improvement, self-regulation and openness about performance in the environmental arena. To this end environmental management concepts need to be integrated into the overall business process. This philosophy is embodied in a 10-point code which the IEF adopted in 1991.

It is a proactive rather than a reactive approach to environmental issues which stresses that initial investment is invariably more effective than retroactive measures which are generally more costly.

The IEF's first public initiative was the staging of the Southern African International Conference on Environmental Management (SAICEM) in Somerset West in October 1991. This gathering attracted 400 local and international delegates and speakers. It provided the springboard for ideas and initiatives. Indeed SAICEM conferences have become milestones along the road to improved environmental performance in the region's business. SAICEM 2 was held in conjunction with the Environmental Forum of Zimbabwe at Victoria Falls in 1994.

The IEF also strives to engender environmental awareness by channeling knowledge and expertise to the business community in its region and encourages an atmosphere for innovative thinking rather than prescriptive controls. It believes in providing leadership on environmental issues.

Industrial Environmental Forum of Southern Africa creates environmental awareness, responsibility and leadership through:

- encouraging business participation in environmental policy formulation to ensure cost-effective and achievable standards;
- influencing policies, legislation and standards;
- assisting members develop appropriate policies, systems and programmes;
- monitoring local and international trends;
- representing the concerns of business;
- promoting Southern African business internationally;
- sharing experiences, opportunities and problems;
- training, workshops, seminars;
- organizing and providing input to conferences and symposia;
- developing management tools and skills;
- attracting investment and partnership opportunities.

The IEF's mission is to become the preferred voice of business on pertinent environmental issues in the region.

Tanzania

In March 1994, the Department of Environment in the Ministry of Tourism, Natural Resources and Environment launched a one-year pilot project in cleaner production under the financial assistance of DANIDA. It was coordinated by an external consultant assisted by four local experts from the Ministry of Tourism, Natural Resources and Environment, Ministry of Industries and Trade, University of Dar es Salaam and Ardhi Institute. The project, known as Cleaner Environmental Production in Industry in Tanzania (CEPITA), was overseen by a steering committee composed of members from government, industry, academia and R&D institutions. The Director of Environment, who was chairman of the steering committee, was in charge of the management of the project.

CEPITA had the following objectives:

- develop a systematic framework for introduction of cleaner production technologies within selected industries with the purpose of waste prevention at source, and minimization of water, chemical and energy consumption;
- demonstrate possibilities for Tanzania industries to simultaneously improve profitability and prevent at source the environmental impact of waste;
- formulate recommendations for an effective pollution prevention policy and strategy;
- train industrial personnel in cleaner production;
- create cleaner production within government institutions, industry, NGOs and R&D institutions.

Twelve companies were selected for the purpose of demonstrating the cleaner production concept. Companies in Dar es Salaam, Tanga, Arusha, Moshi, Mwanza, Kimamba and Mbeya whose managements were prepared to invest time and energy in the cleaner production pilot project were approached. The companies selected were from the following sub-sectors: metal and electroplating (3), glass (1), cement (1), food and beverage processing (2), soap (2), textile (2) and fibre processing (1). The companies were: Galco, Kioo Limited, Medicare, Tanga Cement Company, Bonite Bottlers, Sunflag, Arusha Galvanizing Company, Mwanza Coil, Lake Soap, Zana za Kilimo, Mbeya Textile Mill and Kimamba Fibre Estate.

Cleaner production options have been achieved through a wide range of prevention or waste minimization techniques: product changes, input

material changes, good housekeeping and technological and organizational changes. A total of 169 cleaner production options (possibilities of preventing waste) were established. These emanated from good housekeeping and innovations in processes and products, while the assessment work was still being carried out by the industries. Moreover, 105 options were considered feasible by the industries. These would consequently be implemented in the near future. Feasibility study had been carried out for 94 of the options and feasibility studies had been started on a further 50 options.

Within the framework of the CEPITA project, barriers that arose at the enterprise level in the course of introducing preventive cleaner production measures had been identified and categorized as organizational, technical, economic and conceptual. Each barrier may in itself slow down or halt the cleaner production process. It is therefore important to establish the cleaner production policy on the broadest basis and to tackle the entire spectrum of possible barriers. The CEPITA experiences have shown that intensive supervision and advice tailored to a specific company can remove a significant proportion of the barriers.

The Cleaner Production Centre of Tanzania (CPCT) established in October 1995, and formally inaugurated in May 1996 is part of the worldwide UNIDO/UNEP National Cleaner Production Centres NCPCs Project. The Centre has also taken over the activities of the CEPITA project. It will document the experiences of the CEPITA companies and assist them in implementing the cleaner production options and adopting the concept as a management tool.

Following the inauguration, one-day awareness seminars were conducted in Dar es Salaam (14 May) and Zanzibar (3 June), for chief executives and decision makers from government institutions and departments. Also in participation were members of academic and R&D institutions, consultancy firms, NGOs, and media institutions. The awareness seminars were held so that participants could understand the CP concept and hence support the cleaner production programmes in their enterprises/institutions, and the country at large.

The Centre also conducted two training workshops for technical personnel in Dar es Salaam (15-17 May) and Zanzibar (4-6 June). The Dar es Salaam industries comprise subsectors of cement, electroplating, beverages, iron and steel, and soap/detergent; while the stakeholders included bureau of standards, city council, factories inspectorate, and NGOs. The Zanzibar companies covered subsectors of food and beverages, essential oils, tobacco, soap, motor repair workshop, fuel transportation/marketing, and motor trading. Public sector participants were from the city council, department of industrial development, and factories inspectorate.

Six industries in Tanzania Mainland and ten in Zanzibar are participating in a cleaner production demonstration project organized and coordinated by the Cleaner Production Centre of Tanzania. This was a result of the two training workshops on cleaner production organized by the Centre, and held in Dar es Salaam and Zanzibar on 15-17 May and 4- 6 June 1996 respectively. The companies in mainland Tanzania are the Tanzania Portland Cement Co. Ltd., Tanzania Breweries Ltd., Colgate Palmolive Ltd., National Bicycles Co., Shivji & Sons Ltd., and Motisun Holdings Ltd. The companies in the Isles are: the Sugar and Perfume Corporation, Zanzibar Cigarette Company, Zanzibar Edible Oils, Clove Stem Oil Distillery Plant, Zanzibar Bottlers (Coca Cola Company), Bakhresa Flour Milling Company, Bakhresa Soap Ltd., Motor Trade Corporation, and Tractor Repair Workshop.

During the demonstration project, the companies will identify and implement CP options in their production processes. The results of the demonstration project will be disseminated to other similar companies in the country and will act as case studies on cleaner production in Tanzania.

Tunisia

Tunisia has participated in the Environmental Pollution Prevention Project (EP3), a USAID supported initiative aimed at promoting the use of cleaner production practices and systems that will enable industries to improve productivity, reduce pollution and save money. The objective of EP3 was reduction in environmental pollution associated with industrialization and urbanization through the creation of a self-sustaining pollution prevention programme in Tunisia.

EP3 offers technical, analytical and information support to facilitate the adoption of pollution prevention approaches and clean technologies through the following activity areas:

- providing industry with technical assistance to identify and apply no-cost and low-cost pollution prevention techniques and clean production technologies. EP3 conducts plant level assessments of industrial facilities to identify options for improving productivity and reducing end-of-pipe control requirements through waste minimization, source reduction and pollution prevention;
- providing in-country training at a variety of levels within industry, government and non-governmental organizations (NGOs). EP3 tailors its training to different audiences such as plant operators, plant managers, financial analysts and government environmental officials;
- providing information to all concerned parties on general and specific questions related to industrial and urban environmental management. EP3 clearinghouse provides access to technical literature, electronic databases, environmental regulations and other materials on pollution prevention;
- working with the Tunisian Government in order to devise policies and adopt legislation which encourage pollution prevention and promote cooperation between government and industry.

The project was implemented with the help of EP3 prime contractor RCG, Haggler, Bailly Inc., effective October 1993. The strategy to create self sustaining pollution prevention activities in Tunisia focused during the first six months of the life of the project on:

- development and execution of an intensive and extensive pollution prevention introduction, information and education programme: four outreach seminars were implemented throughout the country for awareness building and delivering of the pollution prevention message to industry, government and NGOs;
- conducting five pollution prevention audits (PPA) in private firms in the sectors of car batteries, soap and oil refinery and leather tanning. Many no-cost/low-cost pollution prevention innovations were recommended during these audits, which would enhance companies' financial performance, product quality and image and would significantly reduce consumption of raw materials and natural resources, employee exposure to risks and hazards, pollution generation and discharge into the natural environment. For instance, the PPA made recommendations for one of the audited companies which would save more than 1,000,000 US$/year at a total investment of around 400,000 US$. More than 50% of these savings would be obtained by the implementation of no-cost/low-cost pollution prevention innovations;
- development and execution of a training programme on pollution prevention;
- design and establishment of a local clearinghouse on environment pollution prevention and cleaner production technologies.

The project, which ended in April 1996, was implemented in collaboration with industry through business organizations and the Ministry of Environment.

The Tunisia Cleaner Production Centre joined the NCPC network to continue activities that had been started since 1993 with the support of US AID. Upon withdrawal of the US Aid mission from Tunisia in April 1996, the NCPC programme has agreed to provide support. The focus of the Centre during the NCPC support will be to develop a strategy for its sustainability.

As the Centre has already been active for nearly three years, it has conducted 11 in-plant demonstration and numerous training and awareness raising activities.

This year, the Centre's focus is on textile and tannery sectors for demonstration and training, with plans to organize sector-specific technical workshops and a train-the-trainer workshop. The Centre is to conduct the audits on its own, and also take into consideration options that require major investments. The demonstration in the textile industry has begun and is supported through the Netherlands Management Cooperation Programme (NMCP).

The Centre plans to produce four success stories for dissemination and develop the Tunisia Cleaner Industrial Production catalogue, covering the experiences in CIP in the country. The Centre also plans to develop further its information clearinghouse.

Zambia

In 1994 the Environmental Council of Zambia (ECZ) in collaboration with Det Norske Veritas Development (DNV) of Norway established and

implemented a project entitled "Environmental Management System for Zambian Industries". The Premium Oil Industries (POI) Ltd. was chosen to be a pilot study case. An environmental audit was carried out jointly between the Environmental Council of Zambia (ECZ) and Det Norske Veritas Development (DNV) of Norway. The audit was two-fold: to transfer knowledge to ECZ on environmental management system audit techniques and to assess the environmental situation at POI with emphasis on the management system in place to address environmental issues. The audit results showed that POI was a plant in serious need of both technical and managerial assistance in order to establish sound environmental management.

Phase I of the project was successfully executed by the two parties, ECZ and DNV. This phase involved visiting various industries in the country to make assessment of the environmental situation on site and investigate the willingness of the enterprises to participate in the second phase of the project. A system of environmental audit through a checklist was used.

About 20 industrial enterprises were subjected to the preliminary environmental audit, among them being: the SIDO Tannery, General Pharmaceuticals Ltd., Kabwe Industrial Fabrics (KIFCO), Norgroup Plastics, Mobile (Z) Ltd., Dunlop (Z) Ltd, Ndola Wearing Textiles, Hume (Z) Ltd., Coates Brothers (Z) Ltd., Match Corporation Plant, Ndola Lime Company, Baind and Tatlock, Copper Harvest, Gomma Pharmaceuticals, Zambezi Article Mills, Zambia Sugar Company Ltd., Maamba Ciluries Ltd., Zambezi Textiles (ZAMTEX) Ltd., Choma National Breweries Company, BP (Zambia) Ltd.

The response by the industries to this new phenomenon was very positive and provided good opportunities for a cleaner production programme. The concept was supposed to be tried in the second phase of the project.

Zimbabwe

The Cleaner Production Centre of Zimbabwe was one of the first Centres to become operational on 7 November 1994. Since then the Centre, hosted by the Environmental Forum of Zimbabwe (EFZ) has managed to establish itself as a pioneer and promoter of the cleaner production concept in Zimbabwe. The Centre has managed to conduct awareness seminars and workshops to a varied audience of stakeholders. Most environmental groups in the country now have great respect for the Centre when it comes to environmental issues, resulting in the Centre being requested to make presentations at various seminars and workshops. The Centre has plans to conduct a workshop on total cost assessment (TCA) for accountants in September 1996.

The Centre has also conducted training programmes for graduates in various aspects of cleaner production with the intention of helping the trainees become environmental auditors and/or cleaner production trainers. Some training institutions (JEGA and Aquarius) have also been introduced to the cleaner production concept so that they could ultimately incorporate cleaner production in their curricula. The University of Zimbabwe has been approached and the idea of final-year students carrying out research-oriented projects in cleaner production presented and considered.

With regard to in-plant demonstrations the Centre initiated contacts with the Environmental Forum of Zimbabwe (EFZ) member companies as early as February 1995, which culminated in commitment from National Breweries of Zimbabwe and Zimbabwe Sugar Refineries. This was followed by carrying out of pre-assessment, workshops and full assessment of the enterprises. The Centre is currently conducting assessments at smaller breweries. In March 1996 it organized demonstration project workshops for foundries and breweries where the personnel from these industries were trained in cleaner production techniques and methodologies. Evaluation of the efficiency and environmental impacts of the enterprises was presented. The response from the meeting was positive, with some foundries quite eager to embark on demonstration projects with the Centre.

Regional workshops

The African Business and Environment Associations Capacity Building Workshop, 8-10 November 1995, Dar es Salaam, Tanzania

The overall objective of the workshop was to bring together the business and environmental associations in Southern and Eastern Africa to coordinate programmes and develop a business voice of Africa on topical environmental and sustainable development matters. The workshop was supposed to come up with a set of recommendations for follow-ups and future action by the member organizations aimed at enhancing the development of eco-friendly business policies and practices in the region. In so doing, the workshop would have contributed towards the promotion of environmentally sensitive business entrepreneurship in the region.

The workshop was attended by about 50 senior business leaders drawn from the business community and environmental organizations of twelve countries within the region, namely: Ghana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania Uganda and Zimbabwe.

The organizers were the Industrial Environmental Forum (IEF) of Southern Africa, Johannesburg, AGENDA for Environment and Responsible Development, Dar es Salaam and World Resource Institute (WRI), Washington.

The UNEP Workshop on Cleaner and Safer Industrial Production in the Eastern and Southern African Countries, November 1995, Nairobi, Kenya.

The overall objective of the workshop was to identify region-specific cleaner production issues to be highlighted. Specifically the objectives were to:

- discuss the status of regional cleaner production implementation;
- highlight successful initiatives and the barriers to implementation;
- identify regional issues for the 1996 UNEP Seminar;
- draft Regional Action Plans, with concrete commitments and partnerships, for regional cleaner production implementation.

The workshop was organized and coordinated by the UNEP Regional Office for Africa (ROA), Nairobi, Kenya.

Conclusion

The Africa region has some ongoing activities in cleaner production and related themes either through institutionalized programmes like National Cleaner Production Centres, donor funded demonstration projects or private sector initiated activities. These need to be enhanced through more reliable financing mechanisms and proper coordination. It is in this context that we see the need for the UNEP Regional Office for Africa to be strengthened and to play a more active role in facilitating, coordinating and promoting cleaner production activities in the region. Other institutions and organizations in the region should also play their part accordingly to enable the region to be more dynamic and to establish an active network in cleaner production in Africa.

It is recommended that an in-depth study be carried out to determine the level of cleaner production and related activities and to quantify and document the impact of these activities on the economy and environment of the region.

References

Chishiba, J. and Zulu, P. "The Environmental Council of Zambia Technical Report on Selected Zambian Industries for the Development of Cleaner Production and Environmental Management System in Zambian Industries," December 1994.

Mebratu, D. "Ethiopia Background Article", OECD Workshop on Development Assistance and Technology Cooperation for Cleaner Industrial Production in Developing Countries, Hanover, 28-30 September 1994.

Migiro, C.L.C. "Cleaner Production Programme in Tanzania," African Business and Environment Associations Capacity Building Workshop, Dar es Salaam, 8-10 November 1995.

Mombemuriwo, L. "The Cleaner Production Centre of Zimbabwe Newsletter" Issue No. 1, July 1996.

Tohamy, M.A., "Case Study on the Application of the Cleaner Production Concept in RAKTA Pulp and Article Mill," OECD Workshop on Development Assistance and Technology Co-operation for Cleaner Industrial Production in Developing Countries, Hanover, 28-30 September 1994.

"Project Overview: Environmental Pollution Prevention Project(EP3)/Tunisia," OECD Workshop on Development Assistance and Technology Cooperation for Cleaner Industrial Production in Developing Countries, Hanover, 28-30 September 1994.

The Industrial Environmental Forum (EF) of Southern Africa brochure.

UNIDO/UNEP National Cleaner Production Centre Programme Newsletter, First and Second Quarter, 1996.

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The Regional Seminar on Cleaner Production in Abu Dhabi

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A Regional Seminar on Cleaner Production took place in Abu Dhabi on 10-12 June 1996. The seminar was hosted by the Federal Environmental Agency (FEA) of the United Arab Emirates. The opening and other working session were held at the Abu Dhabi National Oil Company building. This seminar was held under the patronage of H.E. Hamad Abdul Rahman Al Madfa, Minister of Health and Chairman of the Board of the Federal Environment Agency. The opening statement was delivered by Dr Salem Al Dhahiri, the General Director of the FEA, on behalf of the Minister. This was followed by welcoming remarks by the UNDP Resident Representative, Mr Adel Khalifa, and the UNEP welcoming address by Dr Fouad Kanbour.

About 40 participants from five West Asian countries attended the seminar. Because of lack of funds, financial support was extended to Bahrain, Jordan, Oman and Yemen on a first-come basis. Attending were seven government officials, 19 participants from various industries, nine from universities and consultant agencies, and one NGO representative.

The seminar programme covered various aspects related to the generation of wastes and applications of cleaner production. The working session consisted of an overview presentation on the generation of waste in the region, cleaner production strategies, the status of cleaner production worldwide, and the application of cleaner production and environmental auditing in the oil industries. Two presentations were given by the representatives of Bahrain and the municipality of Dubai on action taken towards recycling and waste minimization. Representatives from ADNOC and the Gulf Organization for Industrial Consulting (GOIC) outlined their plan for implementing environmental auditing and other programmes. Activities of two universities related to the promotion of waste management and cleaner production were presented. The most interesting presentations given at the seminar were the four case studies by Aluminum of Bahrain, the presentation by Mershal International on replacement of chemical solvents, and that of Dubai Cables on benchmarking in metal industries. The Abu Dhabi Intercontinental Hotel also presented a paper on the application of waste minimization procedures in the hotel industry. In each case, comparisons of past and present performance were made with regard to waste minimization and cost saving.

Conclusions

In the final session, questions were posed to generate general discussion among participants for the purpose of establishing a framework for recommendations. The participants arrived at the following conclusions concerning the environmental situation in the region:

1. Waste is being generated at an increasing rate throughout the region. Emphasis should be concentrated on reducing waste generation from the petroleum, petrochemicals and chemical industries.
2. No appropriate government legislation is in existence at the present time. Some environmental legislation does exist in some countries; however, implementation and enforcement of this limited legislation are not effective. Economic incentives should be promoted to encourage cleaner production procedures.
3. The lack of governmental legislation, enforcement of the existing legislation, economic incentives, and the absence of waste reduction targets are factors considered to be barriers to the application of cleaner production in the region.
4. Some steps to adopt and implement cleaner production procedures are attempted, but they are scarce and scattered throughout the region and in various industries. Expertise is available on a narrow scale. A cleaner production curriculum in universities is needed. NGOs are active, but they have limited support. They can play a major role in any awareness programme.
5. Cleaner production enjoys a high level of support among some administrators and industrialists. Although it is still in its early stages, there are some success stories of cleaner production application in the region. However there is a need for local capacity building as well as for an awareness programme with special emphasis on business and financial institutions.

Recommendations

After much discussion, the following recommendations were adopted by the participants:

1. A regional centre should be established for the purpose of training, technology transfer, and exchange of information on cleaner production, with special emphasis on the petroleum and chemical industries and in co-operation with UNEP.
2. The enactment of effective legislation and regulation in the region to control the generation of industrial wastes should be remedied. Such legislation should be strictly enforced. Incentives including financial support should be offered to assist and encourage industries to implement this legislation.
3. Training programmes to develop human resources in the use of cleaner production procedures and technologies should be promoted and implemented in the region in cooperation with UNEP.
4. Industries that implement cleaner production procedures in the region should be recognized and supported. The publication of brochures covering these industries, with emphasis on waste reduction and cost benefit, should be considered.
5. Government and other environmental institutions should be strengthened and encouraged to develop their human resources to best implement their duties to protect the environment in the region.
6. In cooperation with governmental institutions, NGOs should be encouraged and supported to promote the implementation of cleaner production and the conservation of natural resources consumption in the region.

Cleaner production in the Mediterranean region

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Abstract
This article summarizes several reports on the importance that cleaner production has as a tool to combat the environmental degradation of the Mediterranean region. An analysis is provided of activities being carried out at the national and international levels. The importance of certain organizations (such as UNEP, UNIDO) in spreading and disseminating cleaner production is stressed.

Résumé
Cet article résume plusieurs rapports traitant de l'importance de la production plus propre comme moyen de lutte contre la dégradation de l'environnement méditerranéen. Il analyse les activités menées actuellement aux niveaux national et international. Par ailleurs, il souligne le rôle considérable que jouent certaines organisations (telles que le PNUE, l'ONUDI) dans l'extension et la diffusion de la production plus propre.

Resumen
Este artículo resume diversos informes sobre la importancia que tiene la producción más limpia como una herramienta para combatir la degradación ambiental de la región del Mediterráneo. Se ofrece un análisis de las actividades que se realizan a nivel nacional e internacional. Se destaca la importancia de ciertas organizaciones (tal como UNEP, UNIDO) en la divulgación de la producción más limpia.

Cleaner production development is of vital importance to safeguard the land and sea against degradation in the Mediterranean region. The recent ECOMED Report on the State of the Mediterranean Environment states that industrial pollution is one of the main causes of such degradation, in combination with random urbanization, uncontrolled energy and water consumption, tourism, the increasing concentration of the population on the coastline, and the basin's economic, social and geomorphological characteristics.

As was said at the Mediterranean Region High Level Advisory Seminar on Cleaner Production, held in Rome in May 1996, there is an asymmetry between the north and south rims, and also between east and west. The principle that international standards have precedence over national or regional ones under the new GATT, underlines the advantages that can be obtained by industries moving towards cleaner production and the need of creating a proper climate to implement it.

On the whole, even though few of the Mediterranean countries have a consistent regulatory framework to promote cleaner production, activities are increasing and several centres dealing totally or partially with cleaner production are active in the region. They have been created and are financed by public authorities, as well as by international agencies or programs.

On a wide scope, the region counts on a basic tool, the Mediterranean Action Plan (MAP), issued from the Barcelona Convention and its Protocols.

The MAP, a part of UNEP's activities, joins together the 21 states surrounding the Mediterranean plus the European Union, and focuses on the environmental protection of the basin. MAP tools to develop the program are the Regional Activity Centres (RAC), each one devoted to a specific activity, based in Athens (Greece), Barcelona (Spain), La Valetta (Malta), Marseilles (France), Palermo (Italy), Sophia Antipolis (France), Split (Croatia) and Tunis (Tunisia). The Barcelona Regional Activity Centre for Cleaner Production (RAC/CP) is, as its name states, devoted to CP activities [see below].

The two latest MAP Protocols (land-based sources and transboundary waste movements) clearly focus on CP as the tool to instrumentalize the policies and recommendations that should be implemented. The same comments can be made on the new Mediterranean Commission for Sustainable Development.

Inter-regional networks of local authorities (cities and/or regions), Chambers of Commerce and NGOs, devoting part of their activities to promote cleaner production and pollution prevention, have been also reported.

There is also an increase in the activities of public-private partnership projects, supported by international institutions and donors.

Activities reported at the national level

Egypt

Egypt reports a growing interest in pollution prevention at source. The Government of Egypt has taken concrete actions to improve general conditions and enforce new regulations for control of industrial emissions (issued in February 1995, they will be imposed after a grace period of three years).

The Egyptian Environmental Affairs Agency has generated a long-term strategy to ensure environmental soundness of industrial development. The strategy includes: (a) developing master policies to promote quality through implementing specific programmes for the abatement of pollution, (b) establishing regional and self-monitoring systems for industrial pollution, (c) requiring new industrial and trade activities to perform environmental impact assessment, and (d) providing financial assistance through international donors to enable major polluting industries to shift to cleaner production and to improve the use of production inputs.

In 1994 the Agency launched a National Industrial Pollution Prevention Programme, financed by international donors for a total of 55 million USD. In addition, about 105 million USD is provided through international funding agencies for financing pollution prevention and waste minimization projects and demo-projects through credits and grants. An additional 350 million USD is being invested through internal financing for pollution prevention and process modernization projects in oil, food, chemical and metal industries.

Several success stories in the sectors of chlorine-alkali production, petroleum refining, dyes and organic chemicals, leather tanning, pulp and paper, aluminum smelting, scrap metals, cement, milk processing, tiles and insulation and recovery of lubricating oils have been reported, showing impressive figures in pollution prevention at source.

In September 1994, USAID launched an Environmental Pollution Prevention Project (EP3). The EP3 project reports 25+20 industrial audits, mainly in the industrial city of Tenth of Ramadan.

Other projects are running with the support of the World Bank Pollution Abatement Project, METAP, the UK Overseas Development Agency (ODA), Japan International Cooperation Agency

(JICA), Danish International Development Agency (DANIDA) or the German Bank for Construction (KFV), among others.

Greece

A Cleaner Production Centre was recently established. Its activities are focused on small and medium-sized enterprises. The Centre, a UNIDO initiative in the Mediterranean and Black Sea region, will try to answer the enormous need for and interest in CP, and will try to capitalize upon the synergy which can be generated by countries cooperating in such an endeavor. This network, while being competent to provide technical assistance on CP issues as required (as NCPCs), aims to assist countries to identify industry-related pollution problems at plant level and accordingly to prepare technically and economically feasible options to solve them. It will further act to facilitate investments to allow the implementation of such identified opportunities.

Italy

Despite the lack of formal legal and financial initiatives, enterprises have begun to reassess their approaches to environmental management and their production processes over the last years. At a national level, the draft of a frame law on waste is under discussion. This draft includes cleaner technologies as the way to reduce the amount of waste generated.

Some of the Italian regions have started pPrograms focusing on CP. Lombardy launched in 1993-94 a Source Reduction in Waste Program, implemented by Lombardia Risorse Spa with the support of the Regional Council, focusing on the introduction of CP approaches in small and medium-sized enterprises.

The City of Rome has promoted the NGO ECOMED, an Agency for the sustainable development of the Mediterranean. Amongst ECOMED priorities is the promotion of CP.

Malta

In 1993, the government published a National (Solid) Waste Management Strategy at the conclusion of a two-year study under the auspices of METAP.

As one of the recommendations, in 1994 the Maltese Government established the Cleaner Technology Centre (CTC), based at the National University and aimed at leveraging limited financial and human resources by promoting collective initiatives amongst government, industry and academia.

The Centre is the result of a tripartite initiative between the Environment Secretariat, the Department of Industry and Malta University Services Ltd.

The Centre has an Advisory Board chaired by the Vice President of the Federation of Industry which comprises members from such diverse bodies as the Chamber of Professional Engineers, University, Department of Trade, Environment Protection Department, Chamber of Commerce, etc. This Board ensures a continuous dialogue among all the shareholders in environmental protection.

The CTC objectives were identified as follows: (a) to encourage industry to apply the least polluting technologies, (b) to transfer know-how to industry about the implementation of cleaner technology, (c) to offer assistance with the analyses of existing systems to find feasible solutions with regard to pollution prevention, (d) to become involved in any initiative likely to lead to cleaner technology being taken up by local industry, and (e) to pursue any other objectives which parties may consent to include.

Other objectives have been added to the initial ones, such as the assessment and recommendations on economic instruments and environmental policy objectives and coordination with the agencies dealing with environmental control.

Dissemination of the CP idea in several economic sectors through courses, seminars, conferences and radio programs has been part of the activities, jointly with an advisory role for some industries and the government. Under the CTC initiative, two credits (EMS and Cleaner Technology) have been included in the Diploma in Engineering Quality program.

Spain

Environmental competencies are transferred to the 17 Autonomous Regional Governments, while the Spanish Government keeps the frame legislation and the launching of general policies and/or programs that gather the regional ones if existing. A National Waste Program has been launched.

An increasing interest in pollution prevention, CP and source reduction is reported, sometimes in relation with the aim of implementing international certification systems.

At a regional level, only two of the Autonomous Governments have reported specific Centres to promote CP and waste minimization: IHOBE in the Basque Country (established 1993) and the CCPI in Catalonia [established 1994].

The Catalan Ministry of the Environment has fixed waste minimization as a priority and decided, in mid 1994, to create a specific unit into its Waste Agency to disseminate and promote the implementation of CP and waste minimization activities, offering to the industrial sectors a useful and neutral tool: the Centre for Cleaner Production Initiatives (CCPI), based in Barcelona.

Its initial objectives are (a) to spread the idea of CP and its advantages in the improvement and competitiveness of the manufacturing sectors, (b) to encourage and cooperate in projects for the reduction of hazardous wastes, and (c) to be a meeting point for people involved in the design of products, processes, equipment, know-how, etc. The CCPI mainly deals with SMEs.

Nearly 50 diagnoses and projects have been developed in metal plating, surface treatment, food industry, leather, textile, paint manufacturing and cable manufacturing industries. The Centre also publishes a series of success stories and collaborates in training courses. The CCPI reports good housekeeping as the main entrance gate to convince companies to implement CP techniques and procedures. From April 1996 a grant has been launched by the Waste Agency to stimulate diagnosis, implementation projects, capacity building and applied research. In July 1996 a similar grant was established by the Sewage Agency.

In spite of minimization and source reduction being a voluntary option for industries, the target in Catalonia is the reduction by the year 2000 of 20% of hazardous waste. From the nearly 300 industries approached by the CCPI, the reaction to CP can be summarized as follows: not interested at all (38%), interested in an ambiguous future (19%), interested only if there is financial support (8%), really interested (35%). Other countries in the Basin report similar figures.

CCPI also reports the different responses of industries when facing wastewater and solid waste. Industrial wastewaters have to support an increasing levy that moves toward cleaner practices while solid waste generation does not have such economic instruments.

Tunisia

Tunisia is active in promoting cleaner production. The Cleaner Production Programme supported initially by USAID, and nowadays by UNIDO, pursues the promotion of CP concepts and practices in industries and the development of national capacity building.

The Tunisian program is active in spreading the concepts of CP through outreach and training seminars (6 with more than 400 participants) and workshops (9 with more than 220 participants).

As of August 1996, cleaner production diagnostic assessments have been carried out at 14 industrial enterprises and two hotels. Industrial sectors included battery manufacturing, metal electroplating, textile finishing, leather tanning, olive oil refining and soap manufacturing. These assessments identified over 293 cleaner production measures with an implementation cost of nearly 2.5 million DT and with savings on operation and management costs estimated to reach 5.3 million DT per year. The recommended measures will annually conserve at least 335,000 m^3 of water, 600,000 kwh, 600,000 m^3 of gas and 630,000 litres of fuel oil, plus savings on raw materials, waste generation and management, as well as decreasing discharge fees and penalties and reducing workers' exposure to hazardous substances.

In addition, the program drafted a white paper with recommendations for cleaner production strategy in Tunisia which resulted in extending the eligibility for Government preferential financing through the depollution fund (fund created by the Government to support industrial companies to protect the environment) to all investment in cleaner production.

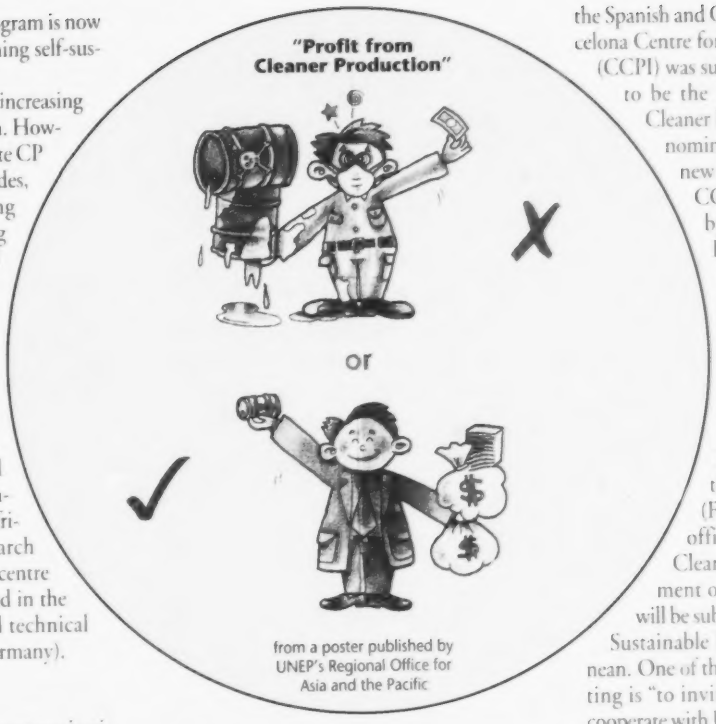
Finally, the program has become a major source of cleaner production information in Tunisia through its information clearinghouse. This clearinghouse is built around a library of cleaner production documentation (hard copies) and a computer-based data management system accessible via Internet called the Tunisian Environmental Information System (TEIS).

Starting in April 1996, the program obtained UNIDO support for a transition period to inte-

grate the network of NCPC. The program is now running with the objective of becoming self-sustainable by the year 1999.

Overall, the program succeeded in increasing the supply side of cleaner production. However, a lot needs to be done to stimulate CP demand from the industry side. Besides, the Tunisian CP program is being adjusted to shift emphasis by giving more importance to the educational and training aspects of CP rather than an exclusive focus on Science and Technology.

Created by law in March 1996 and inaugurated in June 1966, a new Centre International des Technologies de l'Environnement de Tunis (CITE) aims to promote and transfer environmentally sound technologies among Tunisia and other African countries and to develop research and capacity building. The training centre is technically and financially assisted in the frame of multilateral and bilateral technical cooperation programs (Sweden, Germany).



from a poster published by UNEP's Regional Office for Asia and the Pacific

Turkey

Although no specific legislation, centres or institutions to deal with CP have been reported, the Scientific and Technical Research Council of Turkey (TUBITAK) with the support of the Ministry of the Environment is planning to establish a Cleaner Production Technology Institute (CPTI) within the premises of the Marmara Research Centre (MCR), which since 1991, has an environmental engineering department.

The main objectives of the establishment of CPTI are to promote action aimed at protecting the environment from negative industrial impact and to encourage economic growth through industrialization of the country.

CPTI would draw together industry, industry associations, regulatory agencies, research institutions and key policy-makers in a self-supporting and sustaining coalition that would ensure that the CP approach is an integral part of the country's integral pollution abatement programme.

In January 1996 an institute specifically to give service to the Textile Industry Textile Finishing and Apparel Clean Technologies Institute (TFACTI) was established with the following scope:

The major aim of this Institute is to create a focal point in Turkey that can serve the textile and apparel subsectors in the areas of environment-friendly products and clean technologies by organizing the analytical capabilities within the country, by carrying out projects that demonstrate the financial and technical benefits that accrue from the use of such technologies, and by forming a repository of know-how and expertise, a source of information and a centre for training in these fields, which requires higher levels of interdisciplinary specialization and sophistication than can be provided in regular training institutions.

The Institute will complement the efforts of Turkey to increase the competitiveness of the economy, while at the same time implementing a sustainable development strategy in the next five years.

It is expected that the Institute will: (a) act as the hub of a network of analytical capabilities in the country to serve the manufacturer in the areas of raw material, process and product characterization according to internationally recognized norms and standards; (b) carry out projects to demonstrate the benefits accruing from the use of clean technologies; (c) assess and adapt existing clean technologies and develop such technologies relevant to the subsectors concerned; (d) provide training; (e) act as a repository of know-how and expertise and a source of information.

TFACTI is planned to be the seed of the CPTI, which will emerge as an Institute to give service to all the sectors of the Industry, of which TFACTI will be one of the branches.

Cleaner production activities carried out by international institutions, networks, programs, donors, etc.

Many activities on cleaner production are developed in the region rather at national, bilateral or multilateral levels. Many such activities are related to UNEP IE and its Cleaner Production Programme.

These activities are promoted by different actors: municipalities, provinces, regions, international programs, NGOs, industry associations, public-private partnerships, etc. Some of them are reported below:

UNEP's Mediterranean Action Plan

As mentioned above, MAP has approved several protocols that point toward CP techniques and practices to be implemented to ease its enforcement and its implementation by industries. In June 1995, and following an agreement between the Spanish and Catalonia governments, the Barcelona Centre for Cleaner Production Initiatives (CCPI) was submitted to MAP as a candidate to be the Regional Activity Centre for Cleaner Production (RAC/CP). Already nominated by the MAP and under that new commitment, a network led by CCPI will foster CP in the Region by establishing National Focal Points, interchanging information on CP, organizing seminars on common interest techniques and/or economic sectors, promoting capacity building, easing technology transfer and promoting demo projects.

During the Extraordinary Meeting of the Contracting Parties, held July 1996 in Montpelier (France), Ms E. Dowdeswell, in her official speech, mentioned that Cleaner Production will be a key element of the plan of action that UNEP will be submitting on the Environment and Sustainable Development in the Mediterranean. One of the Recommendations of the Meeting is "to invite the Secretariat (CP/RAC) to cooperate with Regional and National Centres for cleaner production in the Mediterranean area".

The Mediterranean Commission for Sustainable Development, to be launched in December 1996 in Fez (Morocco) will be a new framework to promote CP in the region.

Preceded by preliminary meetings, a High Level Advisory Seminar has been convened by UNEP in Marseilles (France) to follow the mandate issued in article 6 of the Barcelona Convention. The aim of the seminar is to discuss and make recommendations on a list of substances that are considered toxic, persistent and liable to bioaccumulate. Other substances and products (like used lubricating oils) should be studied at the same time. The seminar brings together UNEP and MAP officials, government delegates, industry, NGOs and other experts.

The draft document that will be submitted to the Seminar for approval includes several recommendations related to CP.

European Union

Several R&D programs on CP are active. Some of them include actions in the east and south rims.

The AVICENNE initiative is the EU scientific and technical cooperation with Mediterranean developing countries (Algeria, Cyprus, Egypt, Lebanon, Malta, Morocco, Israel, Jordan, Palestine, Libya, Tunisia and Turkey). 15 new proposals worth ECU 5.3 million for research were chosen in 1994 (waste water treatment, renewable energy, etc.)

The SUBSPRINT program is to promote solvent substitution.

BRITE/EURAM is the biggest single program of interest for CP. In it, development of specific new, often cleaner, technologies or product development can be pursued.

LIFE is the financial instrument of the EU's

Fifth Action Programme. Many projects focus on waste minimization.

JOULE/THERMIE, is specific to energy issues.

METAP

Its Third Phase (1996-2000) prioritizes capacity building, participation and partnership through country and sectorial programs, integrated water and coastal management, and arresting and preventing pollution at "hot spots". METAP participation in the projects presented in the Country Portfolios is 61.9 million USD.

METAP aims to help to identify environmental projects, strengthen environmental management capacity, establish environmentally sound policies, and mobilize resources to finance environmental investment in the context of the priority themes.

Euro-Mediterranean Conference

Held in Barcelona in November 1995, the Conference launched a renewed process of cooperation aimed at sustainable economic development, the balanced distribution of resources, and the political stability of the Mediterranean region. In July 1996 their pledge culminated in the adoption of the general regulation on financial and technical measures of the Euro-Mediterranean partnership (MEDA). Under MEDA, 4,684 million ECU will be invested in the Southern Mediterranean region from 1995 to 1999.

UNIDO

In collaboration with UNEP IE, in Paris, UNIDO has launched a new program to support National Cleaner Production Centres (NCPCs), as a cost-effective and sustainable capacity building and demonstration effort. One of the nine NCPCs has been established in Tunisia.

UNIDO also supports the Greek initiative of creating a CP Centre in Athens that aims to be the node of a network amongst focal points placed in the Mediterranean and Black Sea regions.

Centre of Euro-Mediterranean Regions for the Environment (CREE)

An initiative of EU regions on the Mediterranean coastline. CREE has a specific working group on cleaner technologies.

MEDCITIES

In 1993 the MEDCITIES network carried out (under METAP financing resources) five environmental audits in five cities located in Morocco, Algeria, Tunisia, Lebanon and Cyprus.

The main success of this program was the commitment to keep working towards environmental solutions in a participatory manner. In those audits, several common problems were detected (lack of institutional bases for sustainable development, regulations on environmental impact statements seldom enforced, uncontrolled urban and tourist development, water shortage, improper waste management).

MEDCITIES has launched several programs, including ones in the Turkish Marmara Sea, with the financial support of international donors.

Conclusion

Finally, clear and adaptative measures are needed to protect and restore the Euro-Mediterranean environment, as a public patrimony. Generally speaking, the consulted countries agree on some final conclusions:

a) Although CP is rapidly gaining position as a tool for increasing competitiveness and is being considered as a general management instrument, there is still a lack of environmental awareness amongst companies' management. Environment and its management is still considered in most cases only as an added cost. An activation of the local capacity to stimulate cleaner production, products and behavior sensitization is needed, as well as the introduction of the concept of cleaner production in daily life.

b) There are differences on the CP concept amongst different countries.

c) An integral approach is needed to avoid pollution transfer between milieus.

d) There is a need of economic instruments and persuasive tools to promote CP and ease technology transfer. Local capacity building must be promoted as a priority.

e) Good housekeeping has been demonstrated to be the entrance key to get companies interested in CP.

f) Case studies and success stories have to be widely spread.

g) Networking of the different centres and institutions devoted to CP has to be promoted.

h) The transfer of information, experiences and innovations between the Mediterranean region countries and others has to be promoted. ◆

Cleaner production perspectives in Latin America and the Caribbean[1]

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Abstract
In November 1995, a Workshop on Waste Minimization and Cleaner Production in Latin America and the Caribbean was held in Mexico City. This article describes the context in which the Workshop was planned and developed, the most relevant outcomes, and the progress made since then by Mexico in promoting waste minimization and cleaner production.

Résumé
Un atelier sur la minimisation des déchets et la production plus propre en Amérique latine et dans les Caraïbes s'est tenu à Mexico, en novembre 1995. Cet article décrit le contexte dans lequel il a été planifié et élaboré, ses résultats les plus pertinents, ainsi que les progrès que le Mexique a accompli depuis, dans le domaine de la minimisation des déchets et de la production plus propre.

Resumen
En Noviembre de 1995, se organizó en la ciudad de Méjico un Taller sobre Minimización de los Desechos y la Producción Más Limpia en Latinoamérica y en el Caribe. Este artículo describe el contexto en el que se planificó y desarrolló el Taller, los resultados más relevantes y el progreso que Méjico ha realizado desde entonces fomentando la minimización de los desechos y la producción más limpia.

Regional context

Different initiatives are being developed in the Latin American and Caribbean region to induce the reduction of waste generation, in particular of hazardous wastes, and to strengthen national capacities for their environmentally sound management, as well as to prevent and control environmental pollution through the use of "end-of-pipe" technologies or the adoption of cleaner production processes. These initiatives are taking place as independent efforts or as a result of the implementation of policies to improve the competitiveness and environmental performance of industries and services to cope with the challenges and demands arising as a consequence of the globalization of trade; they are for the most part supported by bilateral and multilateral organizations, as is the case of the REPAMAR network supported by the German International Co-operation Agency GTZ.

Pan-American Network for Waste Management

The REPAMAR network was established in 1994 to promote the development of concertation programmes with the participation of industries, governments, universities and commanatory organizations, in order to induce the environmentally sound management of domestic and industrial wastes; disseminate and foster the application of technologies developed in the region by the industries; strengthen the control capacity of governments; and collect and exchange technical information generated by REPAMAR member countries concerning waste reduction and management.

At present, six countries form part of REPAMAR: Argentina, Brazil, Colombia, Costa Rica, Ecuador and Peru; each one of which has established a national waste management network with the participation of representatives of different sectors.

The Pan-American Center CEPIS has developed since 1982 a Pan-American Network on Environmental Health Information (REPIDISCA), linked to other information systems of the United Nations Organization and other agencies. Through the Information System on Waste Management (SIMAR), REPIDISCA offers support to the REPAMAR network on aspects related to technologies and waste management approaches.

In the first phase of the work programme of the network, three studies were completed concerning tanning, textile and metal plating industries, leading to the elaboration of technical guidelines to support waste minimization in these activities. Other achievements included training and health risks reduction related to waste management. In its second phase, the programme will be expanded to include other countries in the network and to develop other case studies related to industries of regional interest. In the third and last phase, the attention will be focused on the self-sustainability of the network to end GTZ financial support.

Promotion of waste minimization and cleaner production in Mexico

In the last decade Mexico has been involved in a process of macroeconomics changes and trade liberalization; as part of this process, in 1994 the country subscribed the North American Free Trade Agreement (NAFTA) and became a Member of the OECD. To support the modernization of its industry, in particular of small and medium industries, and to facilitate exports, different institutions were created to improve the competitiveness and compliance with international quality standards. Most of the universities established mechanisms to strengthen its relationships with the industries in order to develop educative, research and technology development programmes shaped to their needs. Financial and coordination mechanisms were designed to fund "incubator or integrator industries" that address the particular requirements of small and medium industries with the support of regional universities and technical institutions.

In 1988 a new comprehensive Law for the Ecological Equilibrium and Environmental Protection (LGEEPA), several regulations concerning hazardous wastes, environmental impact assessments and prevention and control of atmospheric pollution, as well as different obligatory environmental standards, were published. These legal provisions and the creation in 1992 of two new environmental institutions to regulate and enforce the regulations, the INE and the Office of the Attorney for Environmental Protection (Profepa), triggered the introduction of environmental aspects in the industrial modernization programmes and the establishment in July 1995 of a voluntary agreement on "Environmental Protection and Industrial Competitiveness" between Semarnap/INE, the Ministry of Trade and Industry Development and the National Confederation of Industrial Chambers (Concamin); they also led to the development of a growing market of environmental technologies and services.

During the OECD Workshop on Waste Minimization, held in March 1995 in Washington, D.C., Mexican representatives of different sectors realized that the case studies describing the situation of different waste streams in industrialized OECD countries did not reflect that of Mexico. In fact, waste generators in Mexico do not always valorize their wastes and separate them early at the source for purposes of recycling and recovery of secondary materials, and existent recycling and recovery operations do not cover the wide

spectrum of waste streams. Based on these considerations, the Mexican delegation decided to organize the Workshop on Waste Minimization and Cleaner Production in Latin America and the Caribbean, to learn about the situation in other countries of the region and to compare it with the one in OECD industrialized countries.

Main outcomes of the Workshop

The Workshop was held in the National Polytechnic Institute as a means to support the creation of the Mexican Centre on Cleaner Production, affording the opportunity for personnel and high-level students of the Institute to have an active exchange of experiences with experts from different countries of the region and other regions, as well as with representatives of Mexican industry from different sectors. The idea of involving member countries of the REPAMAR network was to share national and regional experiences and to make clear the advantages of the adhesion of Mexico to the network. Bilateral and multilateral organizations giving support to waste minimization and to the adoption of cleaner production in the region were invited to describe the performance of their cooperation programmes and the barriers encountered in attaining their objectives. Mexican industrial associations and chambers as well as particular industrial sectors were asked to express their experiences or concerns and to take part in working groups to identify means of improving their environmental performance. Many participants indicated that the working groups were the best part of the Workshop, as they allowed multidimensional consideration of the problems, created an active and productive discussion among representatives of different sectors and countries, and expanded the possibility of interaction and understanding between the participants.

The Workshop programme covered a wide variety of issues, including the discussion of the particular problems and approaches followed to minimize wastes and to induce the adoption of cleaner technologies in the metal plating, textile, tanning, electronic, pharmaceutical, oil, sugar, carboelectric, ceramic, and mining industries.

It became evident that exporter industries are in a better position to reduce wastes and to adopt cleaner production than the rest of the industries, not only because they are in a better economic situation, but because they know that to be competitive they need to save energy, raw materials and costs from hazardous wastes management, and they are driven by the need to satisfy the requirements of importing countries that are paying more and more attention both to the quality of their products and to their environmental performance, as occurs in the NAFTA countries and countries that compete in the markets of the European Union. These industries are better informed about the requirements of environmental and sanitary regulations in their own and in the importer countries, are organized in chambers, and have established mechanisms for a continuous updating of these aspects.

1. Identified problems

The following are the more relevant problems identified by the working groups regarding the different actors that play an important role in reducing the generation of wastes and improving the environmental performance of industries in Latin America and the Caribbean.

Government authorities

- Lack of clear and continuous policies to support waste minimization and cleaner production.
- Incomplete regulatory framework and uneven enforcement, leading to overpressure in some industrial sectors, the existence of "free riders", and to highly contaminating industries that are not regulated.
- Regulations are often copied from the ones existing in industrialized countries and do not reflect the national contexts causing the failure in implementation.
- Ignorance of the characteristics of production processes while establishing standards or when inspecting industries.
- Inefficient coordination among different agencies at different levels (federal, state and municipal), creating an excessive burden through repeated inspections and frequent contradictory judgments.
- Excessive bureaucratic requirements and inefficient administrative procedures.
- Lack of economic incentives to foster technological changes.
- Inadequate mechanisms of communication with the industrial sectors.
- Government state-owned industries have a poor environmental performance.
- There is no clear understanding of the differences in means of achieving environmental clean-up (regulations) and cleaner production (voluntary agreements).
- Lack of trust in industries.
- Lack of human resources (both in quantity and quality) and infrastructure to support programmes to promote waste minimization and cleaner production, as well as to enforce regulations.
- Lack of use of indicators to evaluate the performance of regulations and other instruments to induce waste minimization and cleaner production, as well as to prevent and control environmental pollution.

Industries

- Lack of a "waste management culture", leading to the mix of wastes at the source and interfering with the possibility of their recycling or recovery.
- Industry managers, in particular of small and medium industries, do not establish and support the implementation of environmental management policies because they have not included in their production costs the costs of waste generation, inefficient use of energy, raw materials and water, and ill workers' loss of productivity; they do not realize their importance or consider it "normal" to pay such costs.
- In general, the managers of Latin American and Caribbean industries are more "owners of enterprises" than managers in the modern sense, with education and training in managerial techniques.
- Great differences in the capacity to deal with pollution prevention and control among: a) large industries with big capital, b) low-capital small and medium enterprises clustered in one site, and c) dispersed small and medium industries lacking capital.
- As a consequence of the economic crisis many industries are leaving the industrial chambers, losing the opportunities they offer for training, technical advice and easier access to financial support for their technological modernization.
- Great diversity of processes used by industries in the same sector.
- Ignorance of existing environmental regulations.
- Inability to pay the high rates banks are charging for loans to fund technological changes.
- Lack of trust in government authorities.
- Lack of use of indicators to evaluate environmental performance.

Industry workers

- Poor environmental awareness, understanding and training in relation to means for improving the environmental performance of industries.
- Resistance of unions to technological innovations that lead to job losses.

Consultant firms

- Few in number, with poor technological knowledge in many areas.
- Fail in the integral planning and costing of projects to develop the infrastructure needed to prevent and control environmental pollution, due to incompetence or inexperience.
- Use a "technology colonization" approach based only on the import of foreign technologies, instead of on the development of packages that include the adaptation of such technologies to the local needs and training of the users, as well as on the fostering of the development of services for maintenance, repair, and sales of spare parts.

Universities and research institutions

- Slowly updated and rigid educational technological programmes that do not reflect the actual needs of the industries and countries in the region, and do not incorporate the environmental design of products and production processes.
- Poor mechanisms to facilitate the establishment of links with the industries to support technology innovation, adaptation and transfer.
- Lack of a "language" to communicate with the industries.
- Slow response to the demands of the industries and in the delivery of results of their studies and projects.

Elementary and secondary educational programmes

- Lack of an education policy concerning the incorporation of environmental topics throughout the educational programmes.
- Poor environmental education at all levels.

Consumers

- Poor education and understanding in relation of the influence of their choices in orienting the development of cleaner products and processes.
- Poor consumer consciousness of their rights.
- Poor consumer pressure on producers.
- Government agencies and industries do not realize they are consumers who have the power of influencing suppliers to provide environmentally friendly products.
- The information given to consumers to orient their decisions does not take into account the different perceptions of environmental matters according to age, sex, or level of education.
- Producers do not invest in publicity messages to improve the behavior and choice of consumers in an environmentally sound manner.

Public interest groups

- Many of them are considered as part of the problem and not as part of the solution of environmental problems, as they block initiatives to address the management of wastes without proposing or working on viable and environmentally sound alternatives.
- Poor education and understanding of means to prevent and control industrial pollution.
- Weak participation in education and training programmes regarding pollution prevention and consumer orientation.

Bilateral and multilateral cooperation organizations

- Absence of an inventory and divulgence of ongoing cooperation programmes in the field in the region supported by bilateral and multilateral organizations.
- Duplication of efforts that are centered on a few sectors, leaving big gaps in addressing the needs of many other sectors.
- In some instances the transfer of technology is based only on end-of-pipe technologies or on pro-

Colombia: the cleaner production national policy

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The main goals of the Ministry of the Environment are the regulation and management of environmental and natural resources of the country, defining the policy and legislation related to the recovery, conservation, protection, order, management, use and utilization of renewable natural resources and the environment of the nation to ensure sustainable development.

The number of people working in the Ministry is approximately 600.

To achieve human sustainable development, Colombia has adopted a National Environmental Policy with the following programmes: protection of strategic ecological systems, better water, clean seas and clean coasts, more forests, better cities and human settlements, human settlements policy, and cleaner production.

The goal of the Cleaner Production Programme is to introduce the environmental dimension into the productive sectors and guide those sectors towards cleaner technologies and cleaner environmental management.

Selected as priority sectors are the following: energy, mining, transportation, industry and agriculture. Other sectors included are tourism and fishing.

The strategies to achieve this goal are: voluntary agreement processes, development and improvement of environmental legislation, design and implementation of economic instruments, strengthening of institutional capacity, international cooperation, and an adequate enforcement system.

Voluntary agreement processes

The Ministry of the Environment with the public mining and energy sector and the principal industrial associations of the country: the CLEANER PRODUCTION COVENANT. This document, signed on 5 June 1995, contains the framework and guidelines for the commitments required to obtain an improvement in public environmental management and the control and reduction of pollutants by the adoption of cleaner processes and operations.

Based on the general covenant, the Ministry of the Environment signed two regional covenants with industrial corridors. The first regional covenant was signed on 29 September 1995, with the Fundación Mamonal, in the city of Cartagena on the north coast of the country. The second regional covenant was signed with the East Industrial Corporation, located in the northeast of the country in the Antioquia region. Currently the Ministry of the Environment is developing sector and regional covenants with the following sectors: Asocaña (sugar cane production), electric, petroleum, pulp and paper, cement, steel industry, and other industrial corridors.

Development and improvement of environmental legislation

The basic intention is that the regulations can be achieved by the productive sector and have a preventive content. Also the application has to be prioritized. Currently the Ministry is working on the Air Quality Decree, and on the definition of the regulations for water resource and solid waste management. This legislation has a consultation process with the sectors involved. The final issue of this legislation will be at the end of 1996.

Design and implementation of economic instruments

The Ministry will promote economic instrument and legislation proposals to stimulate changes in consumer and producer behavior and the adoption of cleaner production strategies. Currently the Ministry is working on levies and the design of its implementation scheme. In relation to fiscal instruments, the Ministry has issued tax excise and discounts for environmental investments. In relation to financial instruments, a credit line for industrial reconversion of US$ 260 million has been established. Also the local environmental authorities have made investments for reconversion in the industrial sector.

International cooperation

There are specific cleaner production projects with the following governments: Canada, in a programme for cleaner production in the mining and petroleum sectors, and with the Sogamoso industrial corridor. With the German government, through the GTZ agency, the Ministry is developing a project for the small and medium mining of gold, to introduce cleaner production in this sector. From the Dutch government the Ministry has received technical assistance for specific cleaner production projects.

The Ministry of the Environment is also working on the implementation of the Montreal Protocol, and has ratified the Basel Covenant.

For 1997, the Ministry will develop the first step for the implementation of the National Cleaner Production Centre, with UNIDO.

Institutional strengthening

The Ministry is developing educational programmes with the regional environmental authorities. It is implementing the infrastructure for the collection of environmental information and is developing the country's Geographic Information System.

The Ministry is working on strengthening the system of environmental evaluation (licensing).

Enforcement system

The Ministry has established as a priority the development of environmental quality information systems, the creation of spaces for community participation, and the creation of a database on experience in the enforcement of policy, legislation and environmental projects.

Promotion of compliance

Identified as basic actions are the following: adopting agreement processes with specific groups, self-regulation incentive, strengthening of environmental investigation, development of environmental guidelines, demonstration projects, and compliance recognition programmes.

duction processes that are no longer in use in industrialized countries due to their energy inefficiency and poor environmental performance.
- Lack of harmonization of the definition of waste minimization and cleaner production.
- In many instances the objectives of cooperation projects are very ambitious or ambiguous, making successful implementation more difficult.
- The rules of cooperation organizations in many instances are an obstacle to achievement of their objectives because of their inflexibility.

Capital markets and insurance companies
- Capital markets do not offer the menu of options required to finance waste minimization and cleaner production programmes.
- The lack of quantification of the costs of remediation or rehabilitation of the environment and of indemnizations in relation to industrial environmental impacts is a disincentive to the banks and insurance companies to provide loans or insurance.

2. Recommendations
- To develop policies, with the participation of all interested parties, that address the issue of waste minimization and cleaner production as a complex system that requires multiple actions, in multiple sectors at different levels.
- To review existent regulatory frameworks to identify if they need to be amended or improved to eliminate obstacles and to create incentives to waste minimization and cleaner production.
- To develop and implement economic instruments to induce innovation, adaptation and transfer of technologies, to strengthen the infrastructure for waste recycling and recovery, to create or increase the markets for recycled and secondary materials, and to induce waste minimization and cleaner production.
- To promote the adoption of innovative approaches to reduce the release of pollutants and the generation of wastes, such as those based on common sense measures, and the establishment of quantitative targets through voluntary agreements.
- To modernize government agencies at all levels in order to increase their efficiency, improve the quality of their services, simplify and clarify their procedures, and improve the qualifications of their personnel.
- To identify and implement mechanisms in order to recover the costs of government services to strengthen the infrastructure of environmental government institutions.
- To design and implement programmes for the "greening" of government agencies and state-owned industries.
- To promote closer cooperation and communication between governments and industry, to facilitate a better understanding of their concerns and objectives and increase the trust in each other.
- To design a strategy to effectively create industrial managers' awareness and the will to improve their processes of production and their environmental performance at all levels (large, medium and small industries), in all sectors, all over the countries' territories.
- To promote the adoption of good practices of production, responsible care and product stewardship programmes, and of ISO 14000 standards.
- To develop training programmes and materials in close contact with the users (managers and workers) to tailor them to their particular needs, and with the involvement of highly qualified personnel.
- To design and implement mechanisms to create synergies among the Cleaner Production Centers and other institutions working on developing the conditions needed to foster waste minimization and cleaner production programmes (education and research institutions, consultants, services, etc.).
- To develop mechanisms and programmes to raise the level of knowledge and expertise of consultant and services firms.

CETESB and cleaner production policies and activities

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Introduction
Brazil offers many opportunities for industry's greater involvement in the environmental protection area. These opportunities include not only those related to so-called "global problems" but also to the questions associated with sanitation, trash collection and disposal, water distribution systems, sewage systems, sludge treatment and final disposal, and mainly industrial cleaner technologies.

The potential represented by the Brazilian "green market" could be evaluated using the following figures:
- There are indications that total demand in the Brazilian environmental sector will represent more than 5% of the gross domestic product (GDP) – roughly 30 billion dollars.
- The number of local companies in Brazil's environmental markets is relatively small – only about 100 corporations supply around 60-70% of the current demand in that sector.

It is also important to mention that with approval of ISO 14001 in Rio de Janeiro next June, the Brazilian market for pollution prevention and cleaner environmental technologies, goods and services, both on the supply and demand side, will grow, stimulated by environmental awareness and economy globalization.

Brazil and São Paulo: general data
Brazil, the largest country in Latin America, has 3.3 million square miles. The estimated total population is 151.4 million inhabitants, 76% living in urban areas and 35% living in cities of one million inhabitants or more. Brazil's 1995 GDP was 669 billion dollars, around a 20% increase over 1994. The per capita income is approaching US$ 3000 annually.

The state of São Paulo has 96 thousand square miles which represents 2.9% of the country's territory. The estimated total population is 32.7 million, more than 20% of the total Brazilian population, mostly living in urban centres (92.8%). This state accounts for approximately 40% of the Brazilian Gross Domestic Product, has the greatest concentration of industries in Latin America, incorporating one of the largest cities in the world – the city of São Paulo.

The São Paulo metropolitan region has a fleet of approximately 3.5 million vehicles and an industrial area with over 100 thousand small, medium and large enterprises. Forty thousand of these enterprises are considered environmental polluters, and 1200 of them account for 90% of the pollution generated in the state.

Brazil and São Paulo: environmental legal and institutional situation
In Brazil environmental policy is regulated by the 1988 Constitution and the 1981 National Environmental Policy Act, though the legal and institutional framework for pollution control and environmental protection was established in the 1960s. The protection of the environment for present and future generations is a common responsibility of the State and the community, and every citizen is entitled to a sound environment and also to participate in the environmental management process. Economic activities and property rights must be consistent with, and not detrimental to the protection of the environment.

The institution responsible for national environmental planning and coordination is the Ministry of Environment, Water Resources and Amazon Affairs, while national operational and monitoring responsibilities rest with IBAMA, the Brazilian Environmental Agency.

State and local governments, within the limits of the nation constitutional and federal legislation, have broad regulatory autonomy on matters related to environmental protection. Most environmental monitoring and licensing activities rest with state and local governments which also exercise the primary regulatory and technical capacity.

- To create incentives to strengthen the national infrastructure of services to support waste minimization and cleaner production programmes.
- To make accessible through Internet, publish and update periodically an inventory of technological options for waste minimization and cleaner production and successful cases of adoption of such approaches in industries of each region.
- To identify, develop and divulge indicators of environmental performance of governments and industries.
- To accelerate the process of quantification of the costs of industrial environmental and health impacts in order to facilitate the establishment of insurance and the obtaining of loans.
- To develop and implement educational and training programmes for consumers and suppliers.
- To encourage producers to introduce publicity messages to orient the choices of consumers toward environmentally friendly products.
- To strengthen partnerships among universities, research institutions and industry.
- To introduce environmental concerns, concepts and approaches at all levels of educational programmes in order to develop behavior and professional skills that improve the environmental performance of all sectors of society.
- To foster and support the formation of interdisciplinary, intersectorial training teams to provide training for all sectors in order to implement the national environmental policies in this field.
- To promote and support the active participation of social interest groups in the development and implementation of policies to induce the adoption of waste minimization and cleaner production programmes.
- To diversify capital markets to widen the options for getting financial support for waste minimization and cleaner production programmes in particular in small and medium industries.
- To coordinate bilateral and multilateral cooperation efforts and to evaluate critically the obstacles to achieving their goals in order to improve their performance.
- To focus attention on supporting industrial sectors that have initiated the process of adoption of waste minimization and cleaner production programmes to facilitate the complete achievement of their goals.
- To orient efforts to support industrial sectors with higher opportunities to succeed in adopting waste minimization and cleaner production programmes.
- To give priority to cooperation projects that provide an integral strengthening of national technology capacities and capabilities, and that pay more attention to the adoption of cleaner technologies than to end-of-pipe technologies.
- To make accessible through Internet and other means an inventory of ongoing bilateral and multilateral cooperation projects in the region concerning waste minimization and cleaner production.

3. Other issues

Crosscutting issues such as the role of capital markets to support the adoption of waste minimization and cleaner production programmes in small and medium industries; the use of economic instruments to induce waste recycling and recovery; barriers to cleaner production; the use of life cycle analysis for decision making; and technology transfer concepts and managerial concepts regarding cleaner production were also presented at the workshop and some of them where discussed by panels of experts.

Progress made in Mexico after the Workshop

Inauguration of the Mexican Cleaner Production Centre

The Mexican Cleaner Production Centre was inaugurated on December 15, 1995. In its first Report of Activities for the period January-May 1996, it was stated that the first demonstration project had been centered on the metal plating industry; other possible initial demonstration pro-

São Paulo State has a Secretariat for the Environment which was set up in 1986 with a mandate to promote preservation, manage improvements in and recovery of the quality of life, coordinate and integrate environmental protection, and undertake or stimulate a variety of activities with pro-environmental orientation.

Besides the Botanical, Forest and Geological Institutes, the State Secretariat heads two National Reference Centres: the Foundation for Forest Conservation and Protection and the State of São Paulo Environmental Protection Agency (CETESB).

The CETESB

Regulatory pollution control and environmental protection in São Paulo began in 1973 with the establishment of CETESB, whose duties are given by the State Government Law # 997 and Decree 8486 of August 1976. They include the adoption of preventive and corrective measures related to the control of pollutants that may jeopardize public health, and the flora, fauna and natural resources of the State. With a highly developed and qualified technical staff, investments in research, technological development, environmental monitoring and pollution control actions, CETESB has served as a mandating agency, ensuring that industries comply with the state environmental standards utilizing a combination of permits and fines.

CETESB: activities leading to cleaner production policies

São Paulo has the largest industrial base in Latin America, started just after the Second World War. Because CETESB was established around 25 years later and the First World countries' management approach towards environmental protection was predominantly reactive – corrective actions, this has been its main focus all these years.

Since 1992 CETESB has been involved with pollution prevention activities more consistently. In 1993, with the help of the American Consulate, it promoted a video conference gathering its directors, managers and US EPA pollution prevention experts. After that a group of individuals within CETESB sought approval to form a committee that could discuss pollution prevention as its new environmental management approach. In early 1994 the Strategic Planning Group and the directors of CETESB approved the formation of the Pollution Prevention Committee (P2C) responsible for disseminating the P2 concept.

In April 1994, US ETI, the United States Environmental Training Institute delivered a highly interactive one-week course on pollution prevention to CETESB personnel and local industry professionals. At the time, many participants noted that the course presented an approach different to that of CETESB's because it was designed to emphasize cooperation among stakeholders, mainly with industries, in the design and implementation of pollution prevention measures.

After the first P2 course, USETI maintained communication with the P2C and facilitated CETESB's subsequent contact with a private Latin American volunteer non-governmental organization – Partners of the Americas – which sponsored the director of Illinois' Hazardous Waste Research and Information Center to go to CETESB in August 1994 for further discussions and development of P2 approaches.

In January 1995 a new management team took over CETESB direction, due to changes in the São Paulo government administration, and the members of the P2C put forth greater efforts in disseminating ideas on pollution prevention approaches to this new direction team. In March 1995 the Technology Development and Transfer Directory of CETESB synthesized the ideas of the P2C and presented the São Paulo State Environmental Secretary with a Pollution Prevention Plan. The Environmental Secretary has launched further discussions of P2 approaches and has encouraged CETESB to develop projects to fully incorporate them.

Throughout the remainder of the year, projects surrounding pollution prevention grew in number, and in early 1996 CETESB directors, convinced that pollution prevention led to more effective management of the environment, approved the creation of a formal P2 Division on the organizational structure of the company that has the attribution and is discussing a policy to incorporate the P2 concept and foster implementation of cleaner production in CETESB activities in regard to all segments of society.

jects would be developed concerning the smelting and paints and dyes industries. The sector involved in the production of wheat flour products has expressed its interest in getting support from the Center to address its pollution problems and is willing to use its own funds to develop the project.

Progress in the implementation of the agreement on "Environmental Protection and Industrial Competitiveness"

The agreement encompasses a wide range of activities to be developed by the INE and the industries affiliated to Concamin, including regulatory simplification, industrial self-regulation, promotion of competitiveness, information systems development, and training. To support the development of these activities, two studies were carried out in 1995 and completed in 1996.

The first study, on "Prioritary Cities and Industrial Sectors Regarding Industrial Pollution in Mexico", was developed by the INE with the support of the World Bank and combined the use of data from the World Bank Industrial Pollution Projection System with national data and statistics from the National Institute of Statistics, Geography and Informatics (INEGI) to estimate the contribution of different industrial sectors to environmental pollution. The subject of the second study is the "Industrial Environmental Management in Mexico", and it was funded by a Japanese grant administered by the World Bank and sponsored by the INE. The study consists of a survey of 236 industrial facilities (small, medium and large) in four industrial sectors – food products, chemicals, non-metallic minerals, and metals – selected among the most important contributors to industrial pollution in Mexico identified in the first study. The industries studied are located in three types of geographic regions: major urban centers, mid-sized cities, and industrial corridors. The purpose of the survey was two-fold. First, it investigated the positive and negative features of environmental management at the firm and government level and examined internal and external barriers to environmental improvement. Second, it established a baseline against which the effectiveness of activities to be developed under the agreement can be measured. At present, five voluntary agreements have been subscribed with 70 industries to support their self-regulation.

Managerial data for hazardous waste minimization

The Government in Mexico City, with the support of the German GTZ, is developing a training programme for staff of the Government, personnel of the industry and consultants to generate managerial data to orient hazardous waste minimization activities in the industries located in the Metropolitan Zone of Mexico City, as well as the development of manuals. Six industrial sectors (smelting, metal-mechanical, chemical, printing, metal plating, and textile sectors) and 150 enterprises are being studied to generate the data.

Incorporation of Mexico in the REPAMAR network

In October 1996, the Mexican Environmental Waste Management Network (REMEXMAR) was created with the involvement of industrial chambers and associations, academic institutions, professional associations and public interest groups; the INE become the National Coordinating Center of the Network. The next step will be the elaboration of its working programme, the creation of the Information and Communication Center, and its adherence to the REPAMAR.

Notes

1. This presentation does not imply the expression of any official opinion. ◆

Product life cycle management at Nortel

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Abstract
In 1992, Nortel initiated a Product Life Cycle Management (PLCM) programme that commits the company to factoring resource efficiency into all stages of the product life cycle. Nortel's PLCM programme addresses supplier management, builds environmental improvement into the design phase of new products, implements process and materials innovations and alternatives in manufacturing, and provides alternative solutions for product disposition.

Résumé
En 1992, l'entreprise Nortel a lancé un programme de gestion de la durée de vie des produits (PLCM) par lequel elle s'engage à mesurer l'efficacité des ressources utilisées à tous les stades de la vie des produits. Ce PLCM couvre la gestion des fournisseurs, inclut des améliorations à caractère environnemental dans la phase de conception des nouveaux produits, met en oeuvre des procédés et des matériaux novateurs et de substitution au stade de la fabrication, et procure des solutions de remplacement en matière d'élimination des produits.

Resumen
En 1992, Nortel inició un programa de Gestión del Ciclo de Vida de los Productos (PLCM) que compromete a la compañía a descomponer la eficiencia de los recursos en todas las etapas del ciclo de vida del producto. El programa de PLCM de Nortel se dirige a la gestión de proveedores, introduce una mejora del medio ambiente en la fase de diseño de los nuevos productos, pone en práctica procesos y materiales novedosos y ofrece alternativas en la fabricación y soluciones alternativas para la disposición de los productos.

Nortel's approach to environmental management has evolved over time. Starting with end-of-pipe solutions and compliance in the 1980s, Nortel developed fundamental programmes to address discrete sources of pollution for the protection of air, land, and water resources. With numerous successes behind them, Nortel is now moving towards more systematic and comprehensive approaches to addressing environmental issues. For example, the company adopted an Environmental Management System (EMS) standard, and with the PLCM programme they are actively moving beyond manufacturing operations to address the lifetime environmental impacts of products.

Nortel is convinced that environmental excellence is excellent business. They realized this first with chlorofluorocarbon elimination. Nortel saved four times their initial $1 million investment over three years. Similarly, a business case on investment in environmentally related programmes developed in 1995 to support the pursuit of Nortel's environmental targets revealed an impressive 1:4 ratio of investment to return.

With its PLCM programme, Nortel believes they can save money for customers and themselves, increase customer loyalty, and create value for their customers. This case demonstrates how efficient use of resources, such as reusable packaging, longer-life products, and asset recycling, saves money for Nortel and customers, while protecting the environment. Nortel also believes that a segment of the marketplace will choose environmentally preferable products. Indeed, some large telephone operating companies, such as BT and Dutch Telecom, are querying suppliers about the use of hazardous materials in products and product recyclability.

Not all of Nortel's Extended Product Responsibility (EPR) activities are drastic innovations in industrial environmental protection. Nor does Nortel approach environmental activities with a reactionary, knee-jerk philosophy designed to merely generate good public relations. Rather, Nortel's EPR activities are an extension of its business objectives. It engages in activities that are win-win situations and good for business, and good for the environment.

Product life cycle management: from design to end of life

Nortel approaches its product life cycle management programme strategically. Consistent with corporate operating principles, the programme aims to create customer value. Customer value takes many shapes, including: lower lifetime costs of product ownership through resource efficiency; partnerships with customers to improve their environmental performance; and value-added recycling of products at the end of life. PLCM also strengthens strategic alliances with suppliers, which are of growing importance to Nortel's overall business strategy.

In support of its philosophy, Nortel created a new position, Corporate Director of Business Development in Environmental Affairs, to guide and stimulate PLCM efforts throughout the company. The mandate for this position is to improve the environmental performance of the corporation through changes in all stages of the product life cycle AD design, supply management, manufacturing, marketing, distribution, and product disposal. Activities underway include, for example:

- working upstream with suppliers to redefine responsibilities and requirements;
- redesigning products to eliminate toxins and improve resource efficiency;
- improving manufacturing operations through energy efficiency and waste minimization programmes and the research into and use of VOC-free fluxes and lead-free solders;
- implementing packaging improvements that minimize wastes;
- reducing environmental impacts at product end of life through recycling initiatives.

Nortel is also developing guidance and tools to help product and system designers integrate environmental considerations into systems of the future. In 1995, design guidelines were made available online to design engineers. Development of a set of PLCM standards for new product design is underway. Like any Nortel standard, compliance with these standards will be required as part of the product development process.

Over the next several years, Nortel will develop and phase in PLCM standards as they acquire the necessary knowledge and experience to establish appropriate standards. Standards are currently proposed for:

- life cycle analysis, or ecoprofiles;
- hazardous material use (e.g. eliminating use of lead in manufacturing, brominated flame retardants in plastics, chromate metal finishes);
- product packaging (for example, volume reduction, reusable designs);
- manufacturing emissions (for example, reducing VOC emissions, which account for 50 per cent of hazardous air emissions at Nortel sites);
- material reuse and recyclability (for example, material selection, design for disassembly);
- product takeback.

The first series of standards, expected in 1996, will include ecoprofile, manufacturing emissions, and hazardous material use.

The ecoprofile standard will assist Nortel staff in developing the necessary knowledge base to establish future standards. The ecoprofile standard will require design engineers to characterize the product, identifying environmental issues and potential solutions throughout the life cycle, from technological, market, and regulatory perspectives. Introduction of the ecoprofile standard will occur over three years, starting with consumer products and followed by commercial equipment (for example, PBX, Norstar) and infrastructure (for example, switching, cellular) equipment. Information derived from the ecoprofiles will serve as a management tool to establish Nortel PLCM standards and will help focus Nortel's research and development efforts. Ecoprofiles will also be used in marketing and customer communications.

Measuring and communicating environmental performance is a priority for Nortel, and a requirement of their corporate EMS. The company is currently working toward four measurable targets for the year 2000, with 1993 as the baseline year:

- 50 per cent reduction in total pollutant releases to the environment (land, air, and water);
- 50 per cent reduction in solid non-hazardous waste;
- 30 per cent reduction in paper purchases;
- 10 per cent improvement in energy efficiency.

While these initial targets focus mostly on Nortel operations, additional product-related targets will be established over the next several years.

Results

Nortel's PLCM results demonstrate that environmental objectives are supportive of business objectives. To lower product costs, Nortel strives to root out inefficiencies and waste in the design, delivery, and use of its products. Energy efficiency is a major target. Study after study conducted by Nortel identifies energy efficiency as a major leverage point for environmental improvement of products and processes. More energy-efficient products translate directly into lower costs for customers, since energy is a significant cost factor in operating telecommunications equipment.

Over the years, Nortel has made significant progress in reducing the environmental impact of manufacturing processes, including the elimination of CFCs and a reduction in VOC releases. Under the PLCM programme, improvements in manufacturing continue. For example, process development teams are conducting research, tests, and implementing the use of VOC-free fluxes, lead-free soldering, and alternative circuit board coatings. Nortel's PLCM programme, however, moves beyond manufacturing. Below are highlights of some of Nortel's initiatives to improve other aspects of product life cycle.

Extending product life through design

A modular philosophy was adopted for the new Vista telephone models, called Power Touch in the US. The new model allows the customer to upgrade the unit without buying a new one and scrapping the old one. The principle driver behind the design was to create "user value" by leveraging the customer's initial investment through a flexible and upgradeable design. The new model is designed in two parts: a standard base with basic telephony features and an upgradeable slide-in module that can add features such as caller ID, call waiting, a larger screen size or a better graphics display. The base holds its design for a longer period of time, while the module can be replaced to provide the latest features at half the cost of replacing the telephone. This new design minimizes product obsolescence and reduces the volume of product headed for recycling or disposal.

Long-life products are not new to the telecommunications industry, where equipment is typically in the field for 15-20 years. Nortel's Meridian office systems introduced in the 1970s were "backwards compatible" which meant that even in the 1990s a customer can easily upgrade and expand to provide enhanced communication capabilities without replacing the entire system. While the Meridian system was unique at the time, the architecture of new systems is increasingly modular in design, to enhance upgradeability and expansion and to allow "plug'n play" with any manufacturer's equipment.

Supply management and chemical use reduction

Nortel is investigating new business opportunities in supply management to help the environment. In an effort designed to reduce chemical use, Nor-

More on cleaner production regional initiatives

Portugal

INETI, the Institute of Environmental Technologies of Portugal, initiated a number of cleaner production related activities. In 1995, a Cleaner Production Programme was carried out involving nine companies from different industrial sectors: ceramics, cork, glass industry, leather tanning, food industry, fine chemistry, toys, electronic components, and metal working and surface treatment. The Programme included demonstration projects, CP policy development, and information diffusion efforts.

INETI is also engaged in three European research projects on environmental management, eco-design, and sustainable production at local level. INETI is considering establishing a cleaner production centre to be a national focal point for cleaner production activities, specializing in several areas such as tourism or glass manufacturing.

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Lithuania

Lithuania has undertaken a number of cleaner production related activities. The Pollution Prevention Centre, initiated by the World Environment Centre and financed by USAID, is a non-profit that promotes sustainable development through:

- conducting cleaner production assessments, stimulating innovation, and diffusing project results;
- assisting enterprises identify and carry out low- and no-cost "good housekeeping" changes;
- providing technical assistance to enterprises;
- conducting training and seminars;
- acting as an information source.

Located at the Kaunas University of Technology, the Institute of Environmental Engineering was established in 1991 as a research institute, which among other environmental subjects focuses on cleaner production concepts and techniques appropriate for Lithuania and other CEE countries. The Institute has hosted a number of cleaner production seminars.

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Latvia

The Latvian Pollution Prevention Centre was established in 1994 by the World Environment Centre, with USAID funds, to provide technical assistance to Latvian enterprises to implement industrial waste minimization. The main activities include technical assistance, training, and seminars.

To date, a total of 11 enterprises representing five sectors – metal finishing, chemical, dairy, cement and textiles – have participated in the programme. Eighty-eight per cent of the implemented projects had payback periods of less than one year.

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Costa Rica

The Programme for Sustainable Development is a research group in the School of Civil Engineering of the University of Costa Rica. It has a staff of 13 professionals and more than 20 students. Among other activities, the

tel is embarking on an innovative business strategy with its chemical suppliers. In a pilot project at one of Nortel's Ottawa, Ontario sites, Nortel is initiating a new business relationship with its main chemical supplier. Under this new relationship both Nortel and its chemical supplier will have a joint incentive to reduce chemical use.

The hallmark of such a relationship is a change in the once competitive nature of the manufacturer/supplier relationship. Instead of the supplier seeking profit by encouraging Nortel to use more chemicals, under a "shared savings" relationship Nortel and its chemical supplier will work together to minimize chemical use. By offering its supplier a long-term contract with a fixed fee and purchasing services designed to reduce chemical use, Nortel removes the financial incentive of the supplier to sell more chemicals. In such a relationship the supplier is responsible not only for supplying chemicals, but also for providing a variety of services including chemical process expertise, chemical management, storage, and disposal, amongst others. As a result, the supplier has the incentive to help Nortel minimize chemical use by introducing innovations, searching for alternatives to hazardous chemicals, suggesting more efficient chemical processes, and delivering only the quantity of chemicals needed.

Such a supply management relationship allows Nortel to concentrate on what it knows best – network solutions in the telecommunications industry – while leaving the chemicals to the chemical experts. The ultimate impact is reduced chemical use and costs and increased quality in products and processes due to the leveraging of outside expertise. By inviting suppliers into such long-term business relationships, Nortel has become a groundbreaker in the electronics industry in developing business solutions which not only provide great environmental benefit but also reduce costs and increase quality. Thus Nortel is showing that innovative business solutions, in this case in supply management, can help the environment and make good business sense.

New packaging concepts to reduce waste

For Nortel, packaging was an obvious and early target for waste reduction, as legislation worldwide focused attention on this waste stream and disposal costs skyrocketed. A North American packaging council was formed in 1995, followed by a worldwide packaging council in 1996 to promote returnable and recyclable packaging, and to assist Nortel sites in achieving the corporate target for reduction of non-hazardous solid waste. Packaging changes are springing up throughout Nortel as a result, leading to significant cost savings and a 10-15 per cent reduction in packaging volume.

Standardization and redesign of distribution packaging saves approximately $5 million annually. The resultant reduction in the number of box configurations led to greater reuse of boxes, the need for less storage space and sorting, and fewer boxes purchased. Shipping switching products in assembled mode, rather than packaging and shipping components separately for on-site assembly, saves an additional $5 million annually. The "plugs in place" shipping method requires less packaging, and reduces installation time. Nortel designed a new "clamshell" packaging system for shipping circuit boards that eliminates cardboard and foam waste, and is reusable. The packaging is also designed to improve handling and storage for customers. The clear plastic allows customers to scan product bar codes without opening the package and risking damage to the product. The nesting and stacking feature of the clamshell design saves space on the production floor.

Asset recycling

Nortel operates three recycling facilities in North America and one in the United Kingdom with a mission, "to provide entrepreneurial solutions and services for the valued recovery of materials and surplus assets while demonstrating environmental leadership." To accomplish this mission, the reclamation operation provides Nortel divisions and customers with a full range of asset disposal and recycling services, from equipment test and refurbishment to resale of usable components to recovery of precious and non-precious metals and plastics. The operation has good profit margins, with approximately 85-90 per cent of these revenues being returned to business units and even customers where relevant, while 10-15 per cent cover operating costs.

Nortel's reclamation operations date back to the

cleaner production activities include:

- integrating the cleaner production and life cycle analysis concepts into the civil engineering curricula and research programme;
- integrating cleaner production principles, i.e. composting and recycling, into regulation development (solid waste bills);
- researching a methodology to evaluate environmental, natural and health risks;
- researching the link between cleaner production and sustainable development.

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Hong Kong

The mandate of the Hong Kong Productivity Council is to offer comprehensive consultancy services to industry for a better utilization of resources and to improve the value-added content of products and services. Under this purview, the Environmental Management Division, with a staff of 100, provides services on cleaner production, environmental management systems and pollution control activities. Cleaner production-specific activities include:

- organizing international workshops, seminars, and conferences aimed at transferring cleaner production know-how to Hong Kong industry;
- offering industry-specific consultancy services (e.g. metal finishing, textile, tobacco) to support factory level cleaner production implementation;
- designing and running demonstration projects with Asia Productivity Organization support;
- organizing cleaner production study tours to other countries;
- carrying out industry-specific studies on cleaner production for surface finishing, electroplating, and the bleaching and dyeing industry.

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Australia

Australia has been fertile ground for cleaner production activities.

The Australian Center for Cleaner Production operates as an independent "center of excellence" in cleaner production. It is involved in three principal areas: cleaner production technical assistance, education and training, and technology transfer. The Center has two separate training packages related to cleaner production, a two-day course for regulatory personnel and a one-day course for industry. A range of cleaner production consulting activities are available. The Center is working on projects in China and Thailand. It also produces a tri-annual newsletter and a total of 45 case study reports will be completed by the end of 1996.

Another example is Cleaner Production Australia, a small environmental consultancy company dedicated to promoting the philosophy and principles of cleaner production through education, cleaner production assessment services, and technology transfer. The company is also the home of the UNEP Working Group on Metal Finishing and has been active in assisting UNEP, UNIDO and other international organizations in cleaner production demonstration projects throughout the world. Another project underway is to produce and integrate a cleaner production education programme from the pre-school level to PhD.

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1970s, when they opened facilities in Barrie, Ontario to provide an equipment recycling service to Bell Canada, a major customer. The facility primarily processed metal-based product, particularly copper, to achieve maximum separation and recovery value for Bell Canada. The origin of Nortel's US reclamation facility in Durham, North Carolina was quite different; it started in 1990 as a central collection and disposal point for Nortel surplus assets such as desks and other non-telecom office equipment. Today, however, the Durham facility handles mostly telecommunications equipment and is the central return point for Nortel products coming back from the field.

In the US and Canada, the reclamation operation processes 50 million pounds of equipment annually, including central office switches, private branch exchanges, cable and components from excess and obsolete inventory. About 50 per cent of the equipment processed is Nortel's own equipment and excess and obsolete inventory. Trade-ins and removal from customer sites account for the other 50 per cent, although Nortel is actively trying to expand services to commercial customers and suppliers. In the United Kingdom, for example, Nortel negotiated with BT to begin taking back some older varieties of PBX equipment for reuse and recycle. In addition, Nortel is working with other European distributors to develop tailored Product Take Back (PTB) services to suit distributor and market conditions.

Over 90 per cent of the equipment processed at the facilities (by weight) is recovered for reuse or recycling. Product and component reuse and resale (for example, circuit boards, memory chips, line cards) account for approximately 50 per cent of revenues, playing a greater role today than in the past. Three years ago at the Barrie, Ontario facility over three-quarters of the equipment was electromechanical or copper-based cable, which was granulated or shredded to recover metals. In contrast, today more than half the equipment is processed for reuse and resale. There are two reasons for this. First, the value of the recovery of raw materials is declining due to a reduction in the precious metals content of the products processed at the facility. Electromechanical equipment, which is being replaced with digital technology, contained about 0.05 per cent precious metals and gold, compared to less than X per cent in today's equipment. Second, technology is moving at a faster pace, which results in a greater rate of equipment turnover. While the equipment might be obsolete by some customer's standards, it may still be functional or contain reusable parts.

The amount of material going to landfill had decreased from 10 per cent to 4 per cent over the past several years as a result of a zero landfill programme aimed at reducing solid waste disposal costs. (The goal for 1998 is only 2 per cent to landfill.) The zero landfill programme identified alternative disposal options and reuse opportunities for materials going to landfills. One waste stream targeted was pallets. The solution in this case was to route the pallets back to the business units for reuse, rather than disposing of them. As a result of the zero landfill programme, disposal costs at the Durham facility were reduced approximately 90 per cent from 1992 to 1994.

Nortel (Northern Telecom), headquartered in Mississauga, Canada, is a leading global manufacturer of telecommunications equipment. The company provides equipment, services and network solutions for information, entertainment, and communications networks operated by telephone companies, corporations, governments, and other institutions worldwide. Major products include central office switches, private branch exchanges (PBXs), and wireless communications. Nortel operates in more than 90 countries, and employs over 60,000 people. Celebrating its centennial in 1995, Nortel reported revenues of US$ 10.7 billion, of which 60 per cent were earned in North America.

Nortel sees sound environmental management as a key contributor to customer and shareholder value. The company continually seeks to exceed mere compliance and to minimize resource consumption, waste and adverse environmental impact, limited only by technological and economic viability. (Nortel's Corporate Environmental Policy). ◆

Tourism Focus

A regular section reporting on developments in the field of sustainable tourism, and on the activities of the UNEP Tourism Programme

N° 6

The forests of Tierra Del Fuego: the need to support sustainable ecotourism

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Abstract

In the south of the Chilean part of Tierra del Fuego are found the last intact forests of southern fagaceae. A large timber-felling project threatens to bring an end to the pristine nature of this vast region, whose lakes, rivers and wild forests have a great potential for development of ecotourism. It is expected that there will be an increasing conflict of commercial interests.

Résumé

Dans le sud de la partie chilienne de la Terre de Feu, se trouvent les dernières forêts de fagacées demeurées intactes dans l'hémisphère sud. Or, un projet d'abattage à grande échelle menace l'intégrité de la nature primitive de cette vaste région dont les lacs, rivières et forêts sauvages recèlent un potentiel considérable pour l'éco-tourisme. On s'attend à voir éclater un conflit d'intérêts commerciaux.

Resumen

En el sur de la parte chilena de Tierra del Fuego se encuentran los últimos bosques intactos del fagáceo sureño. Un importante proyecto de tala de árboles amenaza con acabar con la prístina naturaleza de esta vasta región, cuyos lagos, ríos y bosques silvestres representan un enorme potencial para el desarrollo del ecoturismo. Es esperable que se desate un conflicto por intereses comerciales.

Introduction

Tierra del Fuego is the southernmost province of the Chilean Republic, located to the south and east of the Magellan Straight on a large island shared with Argentina. Only 7000 inhabitants live in its 50,100 km² (the province is a little larger than Denmark), and they occupy only a small part of the land, living mainly from extensive sheep farming.

The forests of fagaceae

A visitor to the area soon notices that the landscape presents two very different aspects: in the north, steppes covered with bushes and pastures sustain livestock; in the south are found the last links in the Andean mountain chain, untouched by the presence of industry or even of man. Between the steppes and the mountains lie the foothills, a succession of mountain ranges abundant in lakes and wetlands, where the forests of southern fagaceae unfold in all their original splendour.

As occurred across the whole of southern Patagonia, these forests put down their roots and extended across the sedimentary stratum left behind during the last ice age. Today they cover about 5000 km², at latitude 50° south, longitude 69° west. The tree stratum is made up primarily of two species of the Nothofagus group: "*la lengua*" (*N. pumilio*, deciduous) and the "*coigue*" (*N. betauloides*, evergreen), which in certain areas can reach more than 20 metres in height. A dense and varied underforest proliferates below this canopy. All of the vegetation grows on very thin soils, with slow rates of regeneration. Therefore it is not surprising that the trees reach maturity at between 150 and 200 years.

Nearly all of these forests remained under the control of the Chilean State as forest reservations until a few years ago, when privatization policies led to their transfer to individuals. During a short period of time these properties were handed over to private companies. The state only retained control over a few small plots of no forestry value.

In days gone by there was some timber-felling at coastal locations, but in the interior are inaccessible sectors which may be called "virgin" in so far as they have never been exploited or inhabited. The forests of Tierra del Fuego are to this day one of the last reservations of southern fagaceae. The fact that they have been preserved, by and large unspoilt, means they are unique and extremely valuable ecosystems.

A large timber-felling project

The traditional exploitation of these forests took the form of what was known as the "flowering", that is the felling, of the best examples. Local logging companies operated in the area for decades, producing wood for internal consumption using small sawmills, all of which consumed only several hundred hectares per year, causing minimum damage to the ecosystem. But the situation changed drastically. As a result of the growth in the Chilean logging industry and the facilities the government makes available to foreign investors, Trillium Corporation, a large North American company, has purchased 258,000 hectares of woodlands where it intends to carry out the "Rio Condor" project right in the heart of these forests. Ninety-eight thousand hectares of forest will be exploited, at a rate of 2000 hectares per year, by applying a technique which will allow the company to fell up to 60 per cent of the area in the first felling.

Such intensive exploitation may irreversibly alter the original ecosystem, thereby jeopardizing its capacity for regeneration. But the project was approved on easily justifiable short-term arguments such as increased private investment and employment, despite the technical recommendations of State departments which warned of the lack of ecological studies concerning the pre-

Logging in Tierra del Fuego

servation of sustainability. The lands and forests were purchased at a low price and will retain a high percentage of the utilities. The province of Tierra del Fuego and the Chilean State will not receive any tangible benefits that equate to the resources that will be consumed. It is likely that the productive capacity of the exploited forests will be lost and that the land will be degraded. In return, the investment of US$ 150,000,000 over five years promises to improve the depressing economic situation of the province, starting with the creation of 800 permanent jobs over a short period, as stated in the project document presented to the Chilean authorities.

The ecotourism alternative

There is a possible alternative to the logging threat: tourism orientated towards nature. Over the past five years the the flow of tourists who visit the province of Tierra del Fuego for the good fishing, the forests and solitary lakes, and the curiosity of visiting the "end of the world" has consistently increased. By and large, these visitors are foreigners keen on adventure, fly fishing, risk sports and trekking, i.e. ecotourism in any of its aspects: sport, adventure, knowledge. There are currently no reliable statistics for this type of tourism. Some tourist agents estimate that during the last season more than 15,000 tourists trekked through the foothills of Tierra del Fuego or took sea trips to the mountain range's fjords and glaciers.

The income generated by this incipient activity cannot at present be compared to the sums promised by the Rio Condor project. However, the tourism companies have invested large sums, measured in millions of dollars, in the construction of hotels, log cabins and restaurants and the purchase of buses and motorboats. Last year they gave work to 150 people, nearly one-fifth of those Trillium may possibly employ, with less damage to the forest and the countryside.

Growing conflict

The Rio Condor project has provoked bitter controversies in Chile. Private companies, environmental NGOs, the political parties and the Government have all intervened. For its detractors, the project represents "bread for today and hunger for tomorrow", while its defenders maintain that the natural resources are there to be used for the benefit of man and now is the time to do this. The debate has been heated, covering technical aspects, economic analyses and political elements, and has not lacked a substantial amount of common sense on the part of the citizen, who for the first time has been able to participate in this debate as defined in the Environment Law passed in 1994. Meanwhile the Trillium Corporation has been meeting, step by step, the legal requirements placed on it, including the preparation of an environmental impact study, in order to be granted authority to start its exploitation.

It is evident that we are faced with the beginnings of a conflict between commercial forces that will become more acute as both activities, logging and ecotourism, spread and occupy more forest land. These are essentially incompatible activities. Nobody doubts that the perception of the province as unspoilt land holding the promise of adventure, which the tourism companies have disseminated during two years of hard work, will be shattered in the face of trucks loaded with logs, mountains of off-cuttings in the ports, and the sound of chainsaws.

Some politicians and planners have argued that Rio Condor and tourism do not have to clash if they are given their own separate and clearly defined land on which to operate. I do not believe such coexistence is practicable. Firstly, because the areas of interest overlap: the best timber forests in Tierra del Fuego, and the most accessible, are also the best areas for fishing and camping. Secondly, the tourists and logging companies use the same roads and stations, and it would be practically impossible to separate them so that they do not come into contact with each other.

A long-term plan

What should therefore be done with the forests? Should we extract as much timber as possible in order to obtain immediate and certain economic benefits? Or should we favour a form of tourism which leaves the forests intact and keeps a greater share of the profits in the province? Without a doubt, we are looking not only at two different projects but also at two conflicting styles of development.

In contrast to the large timber-felling project, which is supported by transnational capital and powerful technologies, ecotourism in Tierra del Fuego is the fruit of the efforts of small and medium-sized local businesses with little support from government development programmes. Despite this fact, they have managed, over a few years, to demonstrate tourism's potential in the south of Tierra del Fuego via their own growth. The tourism business now seems just as capable of assisting in the development of the province as the large-scale felling of timber, without consuming the forests or altering the landscape.

The 1995-2000 Development Strategy for the province considers both forest production and ecotourism and proposes that support and development should be provided by both the State and private companies over the next two years. But no priorities have been assigned, and preferential or exclusive geographical areas, which could solve the conflicts, have not yet been defined. Greater support should nevertheless be given to ecotourism in Tierra del Fuego: well managed, it would produce a form of development with minimum impacts for society and the environment. What is more, ecotourism is an activity managed by local companies who have reinvested most of their profits in the province.

Where the Government would be of most help in supporting the development of ecotourism in the south is in promoting it abroad. The burdensome, but still perhaps insufficient, promotion carried out by businessmen, mainly directed towards Europe, has always been beyond their means. If a publicity campaign were conducted by the State services for the promotion of commerce via consulates and embassies, it could be fully extended in both its scope and effects, thereby reducing the burden on these businessmen.

The underlying problem is the obvious lack of a development plan which defines what is to happen to the forests of fagaceae. We must study all the options available to determine which option best satisfies the needs of society, the requirements of nature, and economic interests. Concentration on a sole and exclusive use, and pinning all development hopes on a single large project, is risky. When society and its representatives responsibly decide how to get the best possible use from this natural resource, they must do so looking to a horizon which transcends that of our generation. At this point it would be useful to bear in mind the experiences of countries which possess similar ecosystems and have, like Argentina and New Zealand, experienced these conflicts and overcome them with long-term strategies. ◆

Tourism News

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The role of hotel schools in developing sustainable tourism

Two environmental resolutions were adopted at the 35th Annual Congress of EUHOEA International (Association of Directors of Hotel Schools) held 10-18 August 1996 in Nairobi, Kenya. Recognizing the important role of tourism and of hotel schools in the development of sustainable tourism, EUHOEA has decided to set up an environmental committee to implement the following projects:

- the development of tools to assist hotel schools to introduce environmental curricula into their programmes;
- a manual to promote the incorporation of environmental practices in the design, construction and management of hotel schools (as many of these schools are being built worldwide).

UNEP IE will collaborate in the implementation of the above projects. ◆

Tourism and Environment Seminar in Malta

Approximately 100 tourism professionals and hoteliers in Malta attended the seminar on "Tourism and Environment" on 27 September 1996, organized by the Environmental Protection Department and the Office of the Parliamentary Secretary for Tourism, in collaboration with the Cleaner Technology Centre of Malta and that country's National Tourism Organization. A representative of UNEP IE made a presentation on "Operating Your Business Environmentally".

For further information, please contact: Mr Alex Iscenaja, National Tourism Organization, 200 Republic Street, Valletta, CMR 02, Malta. Fax: +356 220401. ◆

Conference on Implementation of Ecotourism Planning in Thailand

The Second International Conference on the Implementation of Ecotourism Planning, Developing and Managing for Sustainability was held in Bangkok Thailand, on 18-21 July 1996. Through the presentation of 13 reports which included studies of Nepal, Hawaii, Malaysia, Micronesia, Pakistan, the Philippines and Thailand, discussions were held on several themes including ecotourism strategies, databases for information and research, pilot projects, and education and training requirements.

For further information, please contact: Institute of Ecotourism, Srinakharinwirot University, Prasarmmit, Thailand. Fax: +662 25 84 006, 25 44 599. ◆

PUBLICATIONS

Global Tourism, the Next Decade

Twenty-five articles are collected in this publication, which examines the critical issues and problems facing the tourism industry including the impacts of tourism, management and policy issues, and planning and development.

Ed. William Theobald (1995). Butterworth-Heinemann Ltd, Linacre House, Jordan Hill, Oxford OX2 8LP, UK. ISBN 0 7506 2353-5. ◆

The Economics of Leisure and Tourism

This publication covers issues forecasted to affect tourism in the next century, including environmental impacts, globalization and green consumerism.

By John Tribe (1995). Butterworth-Heinemann Ltd, Linacre House, Jordan Hill, Oxford OX2 8DP, UK. ISBN 0 7506 2342 X. ◆

Wildlife Tourism

Using case studies carried out worldwide, this book examines wildlife tourism management problems. The environmental impacts of tourism are demonstrated and issues such as tourism's contribution to local communities, changes in wild animals' natural behaviour patterns, and the future of ecotourism are discussed.

By Myra Shackley (1996). International Thompson Business Press, Berkshire House, 168-173 High Holborn, London WC1V 7AA, UK. ISBN 0-415-11539-6. ◆

A Guide to Energy and Water Conservation in Hotels

This practical guide was developed by the Hong Kong Polytechnic University, Department of Building Services Engineering, in collaboration with the Hotel Nikko Hong Kong. Based on experiences gained from auditing hotels in Hong Kong, it includes a Good Housekeeping Checklist and an energy management action plan covering air conditioning systems, boiler plants, lighting systems, other engineering systems, and water conservation.

For further information, please contact: The General Manager, Hotel Nikko Hong Kong, 72 Mody Road, Tsimshatsui East, Kowloon, Hong Kong. Fax: +852 2311 3122. ◆

World News

China: taking action on global warming

The China National Environmental Protection Agency (NEPA) has published a summary report of its study on control of greenhouse gas (GHG) emissions, *Issues and Options in Greenhouse Gas Emissions Control*. The study was undertaken jointly with the State Planning Commission of China, the United Nations Development Programme and the World Bank and was supported, in its pilot phase, by the Global Environmental Facility (GEF).

As its starting point the study gives a baseline scenario for GHG emissions for the years 2000, 2010 and 2020, before going on to discuss options for reductions in GHG emissions in four areas: energy use, alternative energy, forestry and agriculture.

The baseline scenario assumes that current trends in economic growth in China will continue and that energy efficiency improvements of the type made in the past decade will also continue. Under this scenario, total annual energy consumption rises to 3.3 billion tce (tonnes of coal equivalent) and total annual GHG emissions triple to over 2.3 billion tonnes of carbon (tC). Table 1 shows figures for the baseline scenario and the assumptions on which it was based.

In the coming decades Chinese industry, driven by economic growth, will undergo dramatic transformation and opportunities will arise for energy gains during this process. Efforts to improve efficiency in use of energy and materials will be an important factor in all new industrial and infrastructure projects.

Although specific energy-saving technologies are being introduced into China, it is industrial modernization that has had the greatest effect on energy savings in the past decade and this will continue to be the case. Three aspects of modernization are vital for energy efficiency: adopting modern and advanced processes, adopting modern management practices, and achieving economies of scale. Table 2 shows examples of reductions in technical energy requirements for energy-intensive products which could be achieved in the baseline scenario and in a high-efficiency (HE) energy demand scenario. In the HE scenario, key unit consumption parameters were assumed to reach levels close to advanced international ones. Economies of scale in the production of energy-intensive products also make a large contribution to energy savings in the HE scenario. Equally important is the management of new technologies. Chinese industrialists are often unaware of the importance of training personnel in operating, monitoring and maintaining equipment. Research on industrial boilers in China has shown that energy efficiency could be improved by 10-20 per cent if operation was optimized and priority given to maintenance.

"Classic" industrial energy conservation projects and the use of new sources of energy could also make significant contributions to GHG reductions. Table 3 shows how new, low-carbon sources of electrical energy could fit into the country's power-generating system for the year 2020. One scenario is the baseline; the other, a "high-substitution" scenario, reflects the effects of maximum development of alternative energy sources by 2020.

Afforestation, planting of timber and fuelwood, and good management of open forests can make a net contribution to GHG reduction by providing stores for carbon. An analysis of the potential in China shows that a large-scale tree planting programme could sequester 2.4-4.6 billion tonnes of carbon over a 30-year period. If planting were undertaken at a high rate, about 10 per cent of the 2020 emissions in the baseline scenario could be stored.

Agricultural activities are also a source of GHG emissions, mainly methane (CH_4). This emanates from rice fields – at an estimated 11.0-12.8 million tonnes in 1990 – and from the digestion of ruminant farm animals. Additional methane is also produced from animal wastes: 2.7 million tonnes in 1990. Rice cultivation techniques that limit the amount of time rice fields are flooded, changing of cattle breeds, and improved feed programmes could reduce GHG emissions from the agricultural sector by 15-20 per cent.

The study also gives estimates for the costs involved in achieving reductions in emissions. The net cost per unit GHG reduction is calculated using standard cost-benefit analysis and calculating the GHG reductions associated with a given project. The result is a net cost in yuan per tonne of GHG reduced, expressed in present value terms. This technique allows comparison of the costs of very different types of projects.

Table 1
Baseline GHG scenario: results and assumptions for 2020

Results	
Greenhouse gas emissions	
Total	2,398 mtC and equivalent (threefold increase over 1990)
From energy consumption	2,098 (87%)
Other	309 (13%)
Per capita	1.6 tC
Energy consumption	3,300 mtce
SO_2 and TSP emissions	55 mt, 48 mt, respectively
Assumptions	
Economic growth	Average 8% per annum between 1990 and 2020
Macroeconomic structure	Contribution to GDP: slight decline of industry, growth of services, decline in agriculture.
Energy efficiency	Continuation of energy efficiency improvements. Energy-GDP elasticity of 0.5-0.6 maintained between 1990 and 2020.
Alternative energy	Expansion of hydro, nuclear and renewable programmes. Alternatives account for 22% of total electricity supply in 2020 and 8% of total energy supply.
Forestry	No change in the absolute level of net afforestation from 1990.
Agriculture	No change in GHG-generating emission factors (rice, animals, fertilizer) from 1990.

Source: Joint Chinese-international study team, China GHG study

Table 2
Comparison of selected unit energy consumption levels, baseline and high-efficiency (HE) scenarios, 1990-2020

		China		
		1990	2020 (baseline)	2020 (HE)
Steel	(kgce/t)	1,610	1,284	857
Cement	(kgce/t)	208	196	135
Ammonia	(kgce/t)	2,066	1,665	1,258
Thermal power	(kgce/MWh)	427	348	345
Caustic soda	(kgce/t)	1,790	1,325	1,000
Ethylene	(kgce/t)	1,580	1,450	800
Industrial coal-fired boilers	(average efficiency, %)	60	70	73
Electric motors	(average efficiency, mean size, %)	87	90	92

Source: NEPA

Table 3
Electricty supply scenarios, 2020 (TWh)

	1990		Baseline		High substitution	
	(TWH)	(%)	(TWH)	(%)	(TWH)	(%)
Hydro	126	20	601	16	719	19
Nuclear	0	0	208	5	568	15
Other renewables	0	0	45	1	208	5
Fossil fuels	495	80	2,996	78	2,355	61
Total	621	100	3,850	100	3,850	100

Source: NEPA

Table 4
Estimated net cost of reducing GHG emissions in China with commercial technology (1990 Y/tC)

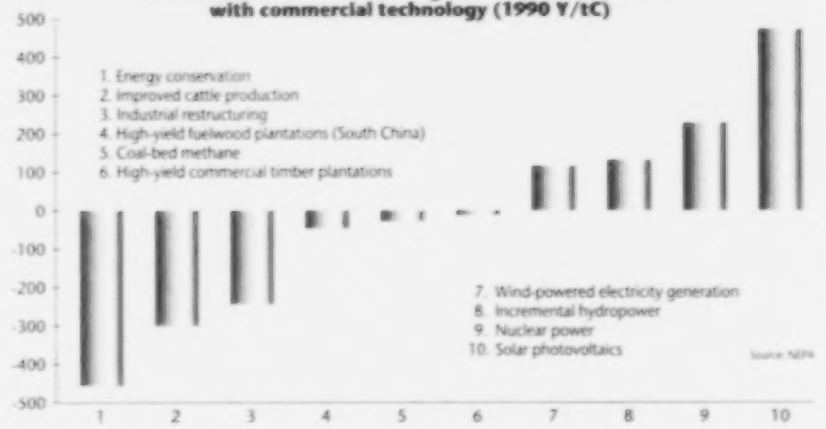


Table 4 illustrates the potential costs of some of the choices China will have to make on the road to sustainable development.

For more information, contact: Project Management Division II, Foreign Economic Cooperation Office, China National Environment Protection Agency (NEPA), 115 Nanxiaojie, Xizhimennei, Beijing 100035, People's Republic of China. ◆

The Environmental Action Plan of China – keeping pace with economic development

China's gross industrial output in 1990 was three times that of 1980, and the country's economy grew by around 13 per cent per year throughout the 1980s. In spite of this rapid economic growth, China's industry is facing the problem of obsolete technology and equipment, resulting in very high levels of energy consumption and pollution. With rapid development set to continue throughout the 1990s, China's State Planning Commission and National State Environment Protection Agency have formulated an environmental action plan for the period 1990-2000, the *Environmental Action Plan of China*. Preparatory work for the action plan was supported by the International Development Association (IDA), a branch of the World Bank.

In addition to the major sources of pollution – industry and energy – the plan covers urban environmental protection, forests and grasslands, agriculture, rivers and seas, and nature conservation programmes, to provide the basis for a comprehensive approach to environmental issues. Policies and management, environmental education, and investment levels (both present and future) are also covered. Details of some of these investments are shown in **Table 1**. Through this wide-ranging approach China intends to reconcile the demands of economic development with the need for environmental protection.

Many environmental problems in China result from a history of poor management and an inability to enforce existing environmental legislation, a situation addressed by the action plan. Legislation is supposed to be enforced at provincial, municipal and county levels by Environmental Protection Bureaux (EPBs). Grave problems of enforcement have been identified, and a Committee on Environmental Protection has been set up to supervise and advise on the operation of these enforcement bureaux.

More than 70 per cent of the country's pollution load comes from industry. Control of industrial pollution is therefore one of the focal points for environmental protection. The solution to a major part of China's industrial pollution problems will come from scientific and technological advancement, coupled with policies taking account of the environmental impacts of all kinds of industries and products. The action plan recommends active support for the development of an indigenous environmental protection industry and for the spread of advanced technologies for environmental control. The main objectives outlined for industry for the end of the century are: reduction in discharges of toxic wastes; control of chemical oxygen-demanding wastes in water; lowering of sulphur dioxide emissions; increased re utilization of waste; and gradual development of centralized disposal of toxic wastes.

Chemical industries still lag behind in the area of environmental protection, although significant progress has been made recently. Currently the chemical industries generate 20 per cent of wastewater, 8 per cent of waste residues and 5 per cent of waste gases. Moreover, these industries are the major source of discharges of toxic substances such as mercury, phenol, chromium and cyanogen. In the metallurgical industries, specific problems of inadequate environmental protection equipment preventing emissions being brought into line with standards have been identified.

China's rapid economic development has been characterized by an increase in the number of small factories throughout the country, and by the spread of small units known as township and village enterprises (TVEs). The value of the industrial output from these TVEs is estimated at 850 billion yuan at present, and they were known to employ 96 million people in 1991. Although TVEs have made a major contribution to economic development throughout the decade, they have resulted in a proliferation of point sources of pollution, creating additional difficulties for control and management.

An important aim of the action plan is to reinforce monitoring and control of those enterprises responsible for most of China's industrial pollution, and targets are accordingly set. By the year 2000, the total amount of industrial wastewater discharged should be less than 30 million tonnes; the amount of wastewater for every 10,000 yuan-worth of industrial production should be 120 tonnes; sulphur dioxide emissions should not exceed 18 million tonnes; soot and dust should not exceed 14 million and 7 million tonnes, respectively; and 90 per cent of industrial waste gases should be treated.

China is still burning large amounts of coal for generating electricity. Around 76 per cent of the country's electrical power is obtained in this way, making the power industry the country's main source of atmospheric pollution. Coal consumption is expected to reach 1.4 billion tonnes by the year 2000. Combustion of coal for energy is the major source of emissions of carbon dioxide, sulphur dioxide and soot. Problems are also caused by the large amount of coal gangue produced, over 100 million tonnes each year, and by polluted water from coal washing. In spite of the large amounts of coal consumed, only a small portion of the electrical energy produced reaches the rural population. 80 per cent of China's population lives in rural areas where the major energy sources are the traditional ones of crop straw, firewood and cogongrass. In many areas, these biomass resources are used in an unsustainable way and over-consumption has led to destruc-

Table I
Environmental action plan of China – investment requirements

Requirements of investment in pollution control (1991-1995)			
Medium	**Item**	**Required unit investment (billion yuan)**	**Total investment (billion yuan)**
Air pollution control	Central heating	6.0	
	City gas	9.0	
	Civil and industrial briquettes	3.0	
	Treatment and recovery of process waste gas dust and soot from industrial boilers	9.0	36.5
	Demonstration projects of smoke elimination, dust removal and desulphurization for coal-burning power stations	7.0	
	Urban afforestations	2.5	
Water pollution control	Construction of urban drainage and sewage treatment facilities	12.0	39.0
	Construction and renovation of industrial wastewater treatment facilities	27.0	
Solid wastes pollution control and others	Comprehensive utilization, storage and disposal of industrial wastes; treatment of urban refuse; control of noise; etc.	23.0	23.0
Total requirements (billion yuan)		98.5	

Requirements of investment in ecology protection (1991-2000)		
Medium	**Item**	**Required unit investment (billion yuan)**
Ecology protection	Forest ecology construction	50.0
	Grassland ecology construction	45.0
	Soil erosion control	27.0 - 40.0
	Desertification control	8.0
	Flood and water logging control and irrigation	70.0
	Natural reserves and biodiversity protection	1.0
Total requirements (billion yuan)		201.0 - 214.0

Source: NEPA

tion of forests and chronic energy shortages.

China has been making efforts throughout the 1990s to increase the proportion of energy from sources such as hydroelectric, biogas, solar energy and nuclear power. The action plan recommends that such sources be further developed. It also stresses that priority must be given to upgrading coal refining equipment, use of advanced technology in the oil industry, desulphurization of flue gases from thermal power plants, and energy conservation. Under the plan the Ministry of Energy is responsible for setting targets in these areas. In the coal industry, 90 per cent of coal mine wastewater should meet the existing national standards by the middle of the 1990s; 135 closed-route cycle coal-washing plants are to be built during the decade, so that 85 per cent of coal washing water will meet standards; and the amount of coal gangue used for construction, brickmaking, etc. should rise to around 31 million tonnes. In power stations, efforts are underway to reduce emissions of dust, soot and sulphur. Policies are also being implemented to encourage energy saving, both in production and use.

As China's industry is mainly concentrated in urban areas, the major threat to the urban environment is from industrial pollution. In addition to this threat, many main urban centres lack clean drinking water. In the 1980s more than 300 cities experienced chronic water shortages, and drinking water supply for more than 25 per cent of the entire population did not reach national standards. China's cities also lack sewers and municipal wastewater treatment. More than 40 per cent of newly-built urban areas have no sewer systems. In many cases rain water and urban sewage flow through the same pipes directly into rivers or percolate through to groundwater. Problems are also experienced with air pollution, with collection and disposal of urban solid waste, and with noise. National standards exist in these areas. One of the goals of the action plan is to ensure that they are met by the year 2000, at least in large provincial cities and cities frequented by tourists. Improvements are also planned in industrial cities, with priority being given to sewage disposal, use of central heating and gas for cooking in all urban areas, and garbage disposal.

As a developing country faced with the stress which rapid economic development places on the environment, China recognizes the importance of the support and cooperation of the international community in its efforts to address environmental problems. The action plan specifies three priority areas for international cooperation: personnel exchanges and training; technical cooperation; and aid for environmental projects.

For more information, contact: Project Management Division II, Foreign Economic Cooperation Office, China National Environment Protection Agency (NEPA), 115 Nanxiaojie, Xizhimennei, Beijing 100035, People's Republic of China. ◆

European Commission adopts action programme for groundwater protection and management

The European Commission has adopted an action programme for integrated groundwater protection and management. The aim of the programme, which will not be legally binding, is to improve integration of water policy into other policy areas such as regional and industrial planning and, above all, agriculture. The programme calls upon Member States to develop and implement action plans for sustainable groundwater protection and management at national level.

European Union launches Concerted Action on Risk Assessment for Contaminated Sites (CARACAS) programme

Pollution of soils and groundwater is a complex environmental problem encountered in all industrialized countries. Several European states are in the process of establishing criteria for soil quality and methodologies for risk assessment. In order to concentrate and harmonize the efforts of individual states, the European Union has launched the CARACAS programme (Concerted Action on Risk Assessment for Contaminated Sites). This programme is financed by the European Commission as part of the Environment and Climate programme.

The objectives of the CARACAS programme are to identify, assess and review all relevant research and technical projects developed within the European Union; to propose scientific priorities for research programmes to be developed in Member States; and to provide guidelines and recommendations for risk assessment for contaminated sites.

Work within the programme is concentrated in the following areas:

- human toxicology,
- assessment of ecological risk,
- fate and spread of pollutants,
- on-site analyses and investigations,
- modelling,
- threshold levels,
- risk assessment methods.

The office of the CARACAS programme has produced a questionnaire to identify research and development projects.

For further information, contact: European Commission, DG XI, Rue de la Loi 200, B-1049 Brussels, Belgium. Tel: + 32 (2) 2999 1111.

The role of the EU would be to provide common principles and an overall framework for action.

According to estimates from the European Environment Agency, around 65 per cent of public water supply in the EU comes from groundwater sources. However, the level of dependence varies widely from region to region with some regions obtaining almost all water from groundwater sources while others rely mainly on surface sources. By the late 1980s (the latest period for which data are available), average abstraction for all uses in the EU was 587 m^3 per capita per year, ranging from 156 m^3 per capita per year in Luxembourg to around 1000 m^3 in Spain and Italy. Water abstraction rates increased by 35 per cent between 1970 and 1985.

On groundwater quality, the agency reports that the EU's maximum nitrate concentration limit (50 mg per litre) is exceeded beneath around 20 per cent of agricultural land and that this rate is rising. The agency also estimates that the limit value for plant-protection products is exceeded on more than 25 per cent of agricultural land in the EU/ EFTA area.

The Commission's action programme recommends that Member States' national plans should aim to bring groundwater problems under control by the year 2000. The focus should be on four major areas: planning and management at the river basin level; a rational regulatory framework for fresh water abstraction; development of instruments for control of groundwater pollution from diffuse sources; and control of groundwater pollution from point sources.

For further information, contact: European Commission, DG XI, Rue de la Loi 200, B-1049 Brussels, Belgium. Tel: + 32 (2) 2999 1111. ◆

TerraTec Trade Fair and Forum for Global Environment Markets

Leipzig, 4-7 March 1997

The Terratec Trade Fair, to be held in Leipzig on 4-7 March 1997, is the fifth Terratec event. It will be held in the new Leipzig Exhibition Centre and, for the first time, the trade fair will be accompanied by a Forum for Global Environment Markets. Terratec is a market-oriented event providing a forum at which potential partners from the developing economic regions in Central and Eastern Europe, Asia and the Near East can meet suppliers of environmental engineering and technology.

TerraTec is sponsored by the German government. UNEP is also supporting this initiative.

For information, please contact: Leipziger Messe GmbH, PF 100720, D-04007 Leipzig, Germany. Tel: + 49 (03 41) 6 78-0, Fax: + 49 (03 41) 6 78-87 62.

	Trade Fair	Forum
Dates	4-7 March 1997	4-6 March 1997
Venue	Exhibition Centre, Leipzig	Exhibition and Congress Centre, Leipzig
Topics	Water; refuse; energy; air; measurement, control and analysis technology	International business sales, financial engineering, cooperative and informational management
Content	Market-related exhibition offer of environmental technlogy and services	Action strategies for global environment markets
Target groups	Technology and product Interested visitors from industry and the community	Management reps of export companies
Presentation	Six economic regions from Middle and Eastern Europe and Asia.	

BAPEDAL – Indonesia's Environmental Impact Management Agency

Bapedal, Indonesia's environmental impact agency, is a non-departmental government agency reporting directly to the country's president. Its role is to formulate technical policies to prevent and control environmental pollution, to prevent environmental deterioration, and to restore environmental quality when damage has occurred. Bapedal is backing a wide variety of programmes, including: environmental education and training, eco-labelling, monitoring of air pollution in cities, toxic waste control, and marine and coastal pollution control. Other programmes such as the Clean River Program; Cleaner Production Program, and an Environment Soft Loan Program are aimed specifically at industry.

The purpose of the Clean River Program is to reduce pollution loads discharged into rivers, in order to improve river water quality. As an extension of the Clean River Program, Bapedal also operates a Business Performance Evaluation Program which encourages businesses to comply with environmental requirements on a voluntary basis. As part of this programme, businesses are invited to join an award scheme in which they are given a "grade" corresponding to their level of compliance and reflecting the efforts they are making. The first of these five grades is the "Black grade", given to participating businesses making no particular efforts in regard to environmental control. The highest, the "Gold grade", is awarded to businesses complying with all environmental regulations, making serious and significant efforts on air pollution control and waste recycling, and striving for zero emissions. In 1992, the Clean River Program was itself given an award, by the American Society of Environmental Engineers, for its accomplishments on environmental management.

Bapedal is developing and implementing a Cleaner Production Program in Indonesia that includes development of technical guidelines for each type of industry; environmental audits to identify suitable areas for cleaner production; direct assistance to industry from local or foreign experts; initiation of demonstration projects; and technical research and development. The programmes also promote awareness of the Cleaner Production concept by providing relevant information and publications, and by encouraging training in the field.

Through the Environment Soft Loan Program, operated by Bapedal, the Indonesian government provides support for environmental pollution control efforts initiated by businesses. Under this scheme, businesses within the Bapedal jurisdiction wishing to finance investments in pollution control may qualify for a loan at an interest rate lower than the current commercial rate. The loan period can be from three to 30 years, and there is a repayment "grace period" of one to five years.

For more information, contact: Environmental Impact Management Agency, BAPEDAL, Arthaloka Building, 11th Floor, Jln. Jenderal Sudirman No. 2, Jakarta, Indonesia. Tel: + 62 (21) 252 15 49, Fax: + 62 (21) 251 15 47. ◆

Industry Updates

Intermediate Technology – supporting small-scale mining

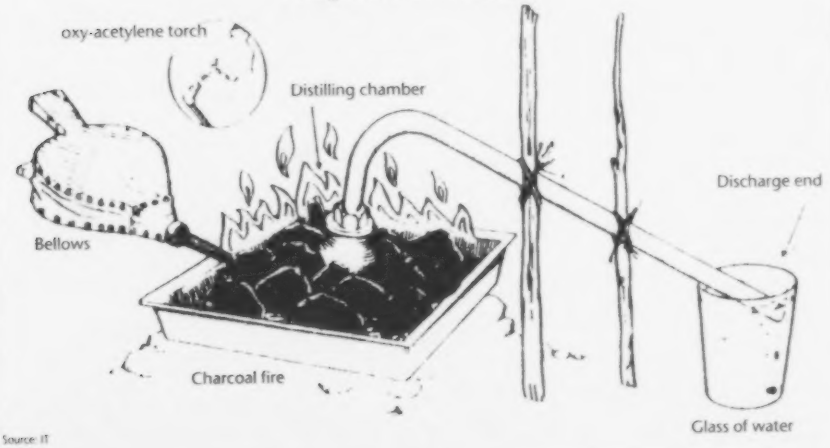
The term "mining" usually conjures up images of large-scale industrial operations dominated by major corporations. Small-scale mining is largely unknown, yet millions of people in developing countries find employment in this sector, which often makes a significant contribution to national, and particularly rural, development. In Zimbabwe, for example, more than 100,000 men and women depend on small-scale mining operations for their livelihood. Although there is no generally agreed definition of what small-scale mining is, for Intermediate Technology, a UK-based organization supporting the activity internationally, the term covers individual miners working for themselves, family groups, small businesses and cooperatives with up to about 15 miners, and miners associations.

In spite of its economic importance, small-scale mining faces a number of obstacles to its development such as difficulties in obtaining financing, lack of suitable technology (most mining equipment and engineering techniques are intended for large-scale operations), and lack of suitable and adequate training. The most common attitude on the part of authorities is to ignore the activity or, worse, to consider it as an illegal nuisance.

Intermediate Technology (IT), one of the few international organizations supporting small-scale mining communities, offers help in several ways. These include introducing locally made equipment and tools for mining operations. An example of this is given by **Figure 1**, which shows an IT design for a closed retort to contain the mercury used to recover gold. Use of a closed retort is necessary to prevent miners inhaling dangerous fumes and to avoid disposal of the mercury into water courses. IT also helps miners to adopt more productive, safer and more environmentally-sound working practices; improves access to information on small-scale mining; strengthens local organizations representing miners; and helps decision-makers to understand miners' needs.

For more information, contact The Mining Programme, Intermediate Technology (ITDG), Myson House, Railway Terrace, Rugby CV 21 3HT, UK. Tel: +44 (0788) 560631, Fax: +44 (0788) 540270. ◆

Figure 1
Design for a closed retort



Source: IT

Green Auto Racing – national efforts and international cooperation to promote advanced cars and fuels

1996 is the one-hundredth anniversary year of the automobile. To mark this centenary, the National Resources Defense Council's Earth Summit Watch (NRDC ESW) has published a survey of national efforts and international measures for cooperation to foster the development of advanced cars and fuels. The survey was carried out jointly by the NRDC ESW, the Climate Action Network and Naturschutzbund Deutschland.

When Henry Ford unveiled his Model T automobile, towards the beginning of this century, many were sceptical as to the future of his "horseless carriage". However, by the 1950s there were 53 million automobiles on the road. Over the next 45 years this figure increased to over 300 million and the global upward trend is expected to continue. Some experts predict that the fleet could double over the next 25 years and that there could be as many as 1.3 billion automobiles on the road. The massive and rapid increase in automobile use has led to the automobile becoming a major source of atmospheric pollution. An average medium-sized car in the European Union (EU) emits three tonnes of carbon dioxide each year. Automobiles are also an important source of other pollutants including carbon monoxide, nitrogen oxides and hydrocarbons.

In entitling its survey *Green Auto Racing*, the NRDC ESW indicates that its survey is to be a timely reminder that urgent attention needs to be paid to global automobile trends and their impact on the atmosphere, and that there is a need for a worldwide strategy. The authors acknowledge that the "race" to develop advanced automobiles and fuels is on, but stress that there is a need to "accelerate" it.

The survey provides government, industry and non-governmental representatives with an overview of national and international efforts to promote the development and utilization of advanced fuels and automobiles. There are reports on the situation in 13 countries, both developed and developing, and an examination of the work of seven international bodies, intended to provide a basis and a stimulus for international discussions.

For more information, contact: National Resources Defense Council, 1200 New York Avenue, NW, Suite 400, Washington, DC 20005, USA. Tel: +1 (202) 289 6868, Fax: +1 (202) 289 1060. ◆

Towards an Environmental Policy for Civil Aviation – advice from the Dutch Council for the Environment

The Dutch Council for the Environment has published an advice document for policy on civil aviation and the environment. Although based on the Dutch experience, the primary aim of the advice is to aid future policy-making at both national and international levels.

Civil aviation is a growth sector. Over the period 1960-1992 passenger kilometres on scheduled flights worldwide grew at an average annual rate of 9.4 per cent, while the world GNP grew at an average 3.7 per cent per year. More recently growth has slowed to around 5 per cent per year. A forecast from the International Civil Aviation Authority (ICAO) until 2003 shows annual growth continuing at around the 5 per cent mark. Like other economic activities, civil aviation has environmental impacts. The two most important of these are noise and greenhouse gas (GHG) emissions from the consumption of fossil fuels.

Table 1
Emissions per passenger kilometer for a journey of 500 km for various transport modes

	Occupancy rate	CO_2 g/p-km	NO_x mg/p-km	CO mg/p-km	VOC mg/p-km	SO_2 mg/p-km
Aircraft	71%	146	440	240	10	10
High-speed train	65%	48	87	2	12	60
Intercity	44%	51	94	2	13	64
Car	2 people	86	270	250	45	7
Bus	70%	22	479	75	56	23

Source: DCE

Aviation fuel is predominantly kerosene, a petroleum derivative. Some 172 million tonnes of it were consumed in 1990, the latest period for which figures are available. By far the greater proportion of this consumption is in developed countries. Figures for annual per capita consumption are 154 kg for North America, 17 kg for Europe and 3 kg for Africa.

Aircraft emissions are not in themselves different from those associated with other forms of transport. **Table 1** shows the comparison for the amounts of different pollutants emitted by various modes of transport. Combustion efficiency in jet engines is generally very high and emissions are carbon dioxide (CO_2), water vapour (H_2O) and sulphur dioxide (SO_2). The high temperature in the combustion chamber also leads to the formation of nitrogen oxides (NO_x), from the nitrogen and oxygen present in the atmosphere. In phases of flight where combustion is incomplete, carbon monoxide (CO) and volatile organic compounds (VOC) are also emitted. Such emissions play a role in enhancement of the greenhouse effect and in destruction of the ozone layer. However, unlike emissions from other forms of transport, the effects of aircraft emissions depend on the altitude at which they take place. Emissions of nitrogen oxides lead to formation of ozone in the upper troposphere at levels which are far greater than would be the case at ground level. In the upper troposphere, ozone acts as a greenhouse gas. Aircraft also fly in the lower part of the stratosphere and, at these altitudes, the emissions destroy ozone in precisely the place where it is needed. With the annual growth rates mentioned above, it is estimated that emissions of CO_2 and NO_x could be three times the 1990 level by the year 2015.

Against this background of increasing activity and consequent increased emissions and nuisances, the Council for the Environment's advice proposes policy instruments in the following categories: technological and operational measures; financial instruments; diverting traffic; and influencing behaviour. The Council suggests that substantial reductions in emissions could be achieved if major efforts are made in research and development to increase engine efficiency. As a financial measure, it is suggested that such research could be subsidized.

Operational measures include the possibility of reducing cruising altitudes and speeds. These measures would require careful analysis. Reducing cruising altitude would alleviate the problems of high-altitude emissions of NO_x, but overall it would lead to an increase in emissions, which may offset the advantages. Equal caution is necessary in reducing cruising speed. For any given aircraft type, cruising altitude and payload, there is an optimum cruising speed. Reducing speed below this threshold will increase emissions of CO_2, water vapour and SO_2.

At present, value-added tax (VAT) is not levied on international airline tickets and aviation fuel is virtually exempt from excise duty. The Council for the Environment suggests that this situation should be reviewed and consideration given to the levying of a tax on aircraft emissions. Tradable emission permits are also proposed as another possible means of reducing emissions. Failure to address the question of emissions, the Council suggests, could bring future airport expansion into conflict with present international policy on climate change.

For more information, contact: Council for the Environment, 30949 P.O. Box 2500 GX, The Hague, Netherlands. Tel +31 (70) 339 15 05, Fax: + 31 (70) 339 19 70. ◆

E3 – the American Textile Manufacturers Institute's environmental programme

The Encouraging Environmental Excellence programme, also known as E3, was launched four years ago by the American Textile Manufacturers Institute (ATMI) to provide member companies with a forum to share ideas and strategies for dealing with environmental concerns.

To qualify for E3 membership, ATMI member companies must be in compliance with all federal, state and local environmental laws. Being in compliance with regulations is, of course, already a requirement for companies, but E3 encourages them to go further, to attempt to be ahead of regulations and to set standards for other industries to follow. In addition to demonstrating compliance, membership of E3 requires companies to adopt a ten-point plan setting annual goals for reducing waste and conserving water and energy. Companies are also required to develop an outreach programme with suppliers and customers, to encourage pollution prevention and waste minimization, to develop programmes for employee education and community awareness, and to audit their facilities.

Each member company must submit a detailed annual report to ATMI describing its progress in achieving environmental goals and setting out new goals for the coming year. Renewal of E3 membership is not automatic. If a company violates an environemental statute it is required to provide ATMI with a written explanation of the violation and a plan for corrective action before recertification is granted.

In 1995, 52 companies were members of the E3 programme. Membership allows companies to advertise their committment to environmental preservation by using the E3 logo and hang tag on their products, and to qualify for assistance from ATMI, in the form of manuals on how to conduct environmental audits, and case studies.

For more information, contact: American Textile Manufacturers Institute, 1130 Connecticut Avenue, N.W. Suite 1200, Washington, D.C. 20036-3954, USA. ◆

UNEP Focus

UNEP signs an agreement with Consumers International

On 19 July 1996 UNEP and Consumers International agreed to become partners in developing programmes to make citizens aware of – and participants in – sustainable development. Both organizations are already involved in raising environmental and consumer awareness. In January 1996, UNEP launched the Global Environmental Citizenship Programme to promote fundamental changes in values, attitudes and behaviour towards the environment. Consumers International, formerly known as the International Organization of Consumers Unions (IOCU), is a federation of consumer groups dedicated to the protection and promotion of consumers' interests worldwide. It currently links the activities of 215 members in 188 countries and represents consumers in many global policy-making bodies.

In 1996 UNEP and Consumers International are joining forces in a campaign on "Safe Food for All", which was the theme of this year's World Consumer Rights Day. The campaign will distribute information to consumers' organizations on various aspects of food consumption and production, including its impact on the environment.

Projects considered under the agreement include distributing information and training about sustainable consumption; holding regional and international workshops for key players to debate and agree on practical solutions to the problems of overproduction and consumption; and creating a consumer charter on the rights and responsibilities of consumers in relation to environmental protection and sustainable consumption.

For more information, contact: Robert Bisset, Media/Information Officer, UNEP, P.O. Box 30552, Nairobi, Kenya. Tel: + 254 (621) 234, Fax: + 245 (226) 831. ◆

UNEP IE and CCEMS prepare for "ISO 14000 and Sustainable Development" conference

During a visit to the China Centre for Environmental Management System (CCEMS) on 19 September 1996, Ms Jacqueline Aloisi de Larderel, UNEP IE's Director, met with Mr Zhen Yanan and his staff to discuss the "ISO 14000 and Sustainable Development" conference (November 1996), sponsored by NEPA, IISD and UNEP IE. The meeting was also the occasion for the signing of the agreement to translate UNEP's EMS Training Resource Kit into Chinese, in time for the November conference.

CCEMS was established in January 1996 as a third-party organization to provide a variety of services (including training, auditing and information exchange) relating to ISO 14000 in China. CCEMS is working to help China keep up with the latest developments in environmental management systems (EMS) around the world. Within China, the activities of CCEMS encompass a wide range of programmes and services designed to foster sustainable development through the establishment and improvement of EMS and implementation of the ISO 14000 Standard series nation-wide.

For more information, contact: 10A, China-Japan Friendship Center for Environmental Protection, Beisihuan Donglu, BJ100029, China. Tel: + 86 (010) 64 92 42 50, Fax: + 86 (010) 64 92 42 51. ◆

Ms Jacqueline Aloisi de Larderel and Mr Zhen Yanan at the signing of the agreement of cooperation between UNEP IE andCCEMS

Joint UNEP and WHO publication: first in a series of groundwater quality regional assessments

As populations grow and their need for water increases, the pressures on groundwater resources are increasing. It is essential that this resource is adequately protected. UNEP and WHO, aware of this issue, considered that a focused report presenting a regional overview of the problems and their causes and recommendations for improvement was needed. They therefore commissioned the British Geological Survey to coordinate an assessment of groundwater quality in the Asia and Pacific region, where more than a billion people are dependent on groundwater for domestic supply.

The resulting report, intended to be the first in a series of regional assessments, has now been published. In addition to presenting an overview of the major groundwater concerns of the region, the report assesses current and likely future groundwater quality problems, both natural and anthropogenic, and identifies the principal threats to the security of this valuable resource.

The report is intended as a tool for training courses at both national and regional levels and as a component of any strategy to improve groundwater management. It is hoped that it will help promote the development of concrete actions for the protection and restoration of critical groundwater reserves, and that it will draw increased attention to the value and vulnerability of the resource.

For more information, contact: UNEP, P.O. Box 30552, Nairobi, Kenya. Tel: + 254 (621) 234, Fax: + 245 (226) 831. ◆

UNEP IE activity summary

UNEP IE works on a wide range of issues through several distinct Programmes. A number of the Programmes produce their own quarterly or biannual newsletter, describing their work in more detail. For more information on all activities mentioned, contact UNEP IE.

Awareness and Preparedness for Emergencies at Local Level (APELL) Programme

A Senior Industry Consultant from the APELL programme provided input to an APELL Seminar/Workshop held on 3-5 July in Carta-

gena, Colombia. The seminar was supported by the Dow Chemical Corporation, through the Fundación Mamonal.

Preparatory work continued throughout August and September for the Fifth APELL Senior Level Expert Advisory Group meeting, scheduled for 7-9 October in Paris.

A Senior Industry Consultant made a pre-APELL visit to Argentina on 1-12 September.

APELL Newsletter N° 13 was finalized.

OzonAction Programme

The OzonAction Programme assisted 100 developing countries to celebrate the *International Day to Protect the Ozone Layer* (16 September) by providing them with information campaign materials developed by the programme.

The programme also participated in several important fora, including the *14th Meeting of the Implementation Committee under the Non-Compliance Procedure* and the 13th *Open-ended Working Group of the Parties to the Montreal Protocol* (Geneva, 23 and 26-29 August respectively), *China's First National Conference on Ozone Layer Protection* (Beijing, 16-17 September), the *Interactive Meeting on the Montreal Protocol* (New Delhi and Pune, 19-21 September), the *Technical Meeting on the Global Programme of Action Clearinghouse* (Geneva, 25-27 September).

The Network of ODS Officers for South East Asia and the Pacific held its meeting in Brunei, Darussalam (3-6 August), in which ten developing and three developed countries participated.

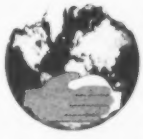
A final draft version of the OzonAction Information Clearinghouse Diskette Version 5.0 (OAIC-DV 5.0) was developed and will be reproduced and disseminated at the end of December.

The OzonAction Programme printed three major updates to the existing series of Sourcebooks of Technologies for Protecting the Ozone Layer: *Aerosols, Sterilants, Miscellaneous Uses, Carbon Tetrachloride, Flexible and Rigid Foams*; and *Specialized Solvent Uses* (in cooperation with US EPA and ICEL). The programme also printed and disseminated the Spanish version of *Good Practices in Refrigeration Training Manual*.

The Programme is assisting Low-Volume ODS-Consuming Countries through the development of innovative approaches to phase out ODS, which, inter alia, includes preparation and implementation of refrigerant management plans.

Tourism Programme

See page 67 for news of activities of the Tourism Programme.



Global Industrial Management Programme

The Environmental Management System Resource Training Kit, produced jointly by the United Nations Environment Programme (UNEP), the International Chamber of Commerce (ICC) and the International Federation of Consulting Engineers (FIDIC), has now been translated into Spanish, Italian, Chinese, Japanese, German and Portuguese. Other translations underway include: Polish, Romanian, Turkish, Icelandic, French, Slovak and Czech.

Over 400 copies of the kit in English have been sold, and another 500 will be printed before the end of 1996. The final draft of the Executive Summary in English is available, and the final copy will be printed by December 1996.

A train-the-trainers seminar was held for National Cleaner Production Centres and World Environment Centre participants, in conjunction with the 4th High Level Seminar on Cleaner Production.

Industrial Pollution Management Programme

Work started or continued on a number of forthcoming publications:

- A technical monograph on Environmental Management of Lead-Acid Battery Recycling was revised.
- A consultant began work on an overview paper on Environmental Management in the Recycling Industry.
- Editing of the technical guide on Environmental Management in the Pulp and Paper Industry continued.
- A technical publication on Environmental Management of Oil Exploration and Exploitation was revised and edited. It is expected that this publication, produced jointly with the E&P Forum, will be completed before the end of 1996.
- A technical report on Environmental Management in the Iron and Steel Industry was revised and edited with the support of the International Iron and Steel Institute (IISI), who prepared the first draft.
- The finally-edited version of a UNEP/ UNIDO report on Industrial Plant Monitoring was received.

Preparation also went ahead for a number of meetings and workshops scheduled for the last quarter of 1996:

- A draft of Technical Guidelines for Planning and Operating Industrial Estates was finalized, by Prof. R. Coté, for an expert meeting in Canada in October 1996.
- Final arrangements were made for UNEP to be represented by a mining specialist at the annual conference and expert meeting of the International Commission on Large Dams (ICOLD) meeting in Santiago, Chile, in October 1996 to discuss construction, use and rehabilitation of tailings dams.
- Case study information was compiled for a training session on mining technology for a forthcoming EnTA workshop in South Africa. This is a joint activity with the International Environment Technology Centre (IETC). ◆

Books & Reports

GENERAL

Tough Choices – Facing the Challenge of Food Scarcity

Food scarcity may be the first major economic manifestation of an environmentally unsustainable global economy. In *Tough Choices* author Lester Brown, president of the Worldwatch Institute, argues that the continually expanding demand for food is colliding with some of the earth's natural limits, including the sustainable yield of oceanic fisheries, the sustainable yield of the aquifers that supply irrigation water, and the physiological limits of crop varieties to use fertilizer.

Tough Choices notes that while growth in production is slowing, the growth in demand may be increasing faster than ever before. Not only is the world's population expanding by 90 million people per year, but the Asian economy is exploding at a rate of some 8 per cent a year, boosting incomes and the consumption of grain-intensive livestock products at record rates. As the region's 3.1 billion people move up the food chain, greater and greater pressure will be put on the earth's land and water resources.

The "tough choices" referred to in the title are those the governments of developing countries that have waited too long to stabilize their populations must soon make: between quickly slowing their population growth or sacrificing any hope of dietary improvements.

W.W. Norton & Company, Inc., 500 Fifth Avenue, New York, N.Y. 10110, USA. Pbk, 159p. ISBN 0-393-31573-8.

International Trade and the Montreal Protocol

The Montreal Protocol on Substances that Deplete the Ozone Layer, established to control the production and consumption of ozone-depleting chemicals, is an important example of an agreement which places restrictions on international trade in the interests of protecting the global environment. Such restrictions could become common in future treaties. *International Trade and the Montreal Protocol* examines the development, effectiveness and future of the trade provisions of the ozone regime. Issues considered include the compatibility of these trade provisions and the GATT, trade restrictions and developing countries, the new problems of non-compliance, and the illegal trade in CFCs.

Earthscan Publications Ltd., 120 Pentonville Road, London N1 9JN, UK. Tel: + 44 (0171) 273 0433, Fax: + 44 (0171) 278 1142. Pbk, 118p. ISBN 1-85383-345-2.

Paper Task Force: Recommendations for Purchasing and Using Environmentally Friendly Paper

Almost everyone uses paper. The average American now uses some 700 pounds of it each year. Use of such large amounts, as with any material, has a considerable impact on the environment. The members of the Paper Task Force, an unusual mix of four of America's premier corporations, a major university and a leading environmental advocacy organization, have come together to find ways of combating these impacts. Their findings and recommendations are published in a two-volume report. The first volume describes the context which readers need to understand if they are to act on the Task Force's recommendations, sets out these recommendations, and summarizes the supporting rationales and options for purchasers.

The second volume is a technical supplement outlining the research supporting the Task Force's recommendations.

Public Information, Environmental Defense Fund, 257 Park Avenue South, New York, NY 10010, USA. Tel: + 1 (212) 505 2100. Pbk, 245p.

The Earthscan Reader in Business and the Environment

This reader brings together articles on the interaction of business and the environment with contributions from business people, environmental consultants and academics.

The main elements of the subject are covered in five sections: perspectives on business and the environment, business strategy and the environment, research development and technology, techniques for environmental improvement, and business and the economy. Each section is accompanied by editorial comment and an overview outlining the key issues.

Earthscan Publications Ltd., 120 Pentonville Road, London N1 9JN, UK. Tel: + 44 (0171) 273 0433, Fax: + 44 (0171) 278 1142. Pbk, 284p. ISBN 1-85383-301-0.

FAO Pesticide Disposal Series

Large stocks of obsolete pesticides have accumulated in most developing countries, as a result of prolonged storage or because they have been banned from use. In the absence of environmentally-sound disposal facilities in developing countries, obsolete pesticide stocks are continuously increasing. The total quantity of these obsolete pesticide stocks in non-OECD countries is estimated to be well over 100,000 tonnes, of which 20,000 to 30,000 tonnes are in Africa.

In 1993, the Food and Agriculture Organization (FAO) started a project aided by the Government of the Netherlands to develop strategies for addressing the problem of obsolete pesticide stocks. The report on the first FAO consultation meeting and a series of guidelines have now been published:

1. Prevention and Disposal of Obsolete and Unwanted Pesticide Stocks in Africa and the Near East – The First FAO Consultation Meeting.
2. Prevention of Accumulation of Obsolete Pesticide Stocks – Provisional Guidelines.
3. Pesticide Storage and Stock Control Manual.
4. Disposal of Bulk Quantities of Obsolete Pesticides in Developing Countries – Provisional Technical Guidelines

Publications Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00100 Rome, Italy.

Environmental Accounting in Industry – A Practical Review

Environmental Accounting in Industry brings together two reports examining the practical applications of environmental accounting in business. They are the result of collaboration between British Telecom's financial advisors, the auditors Cooper & Lybrand, and experts from Ashbridge Management Research Group and Wolverhampton Business School.

The reports conclude that comprehensive environmental accounting is hindered by a lack of accepted definitions covering what should

In reviews of books and reports, all available information is included to help readers locate and obtain particular titles. The following points may be helpful:

In the notes at the end of each review, Hbk and Pbk stand for hardback and paperback respectively. Both hardback and paperback versions of some titles are available. In the case of titles for which payment is required, paperback versions are normally less expensive.

Publishers' telephone and electronic communication addresses are provided wherever possible. For telephone and fax numbers, the "+" indicates country code. Regional codes (shown here as they would be dialled by international callers) are in parentheses. To save space, international and regional codes are given with just the first telephone or fax number in each book review.

The cost of publications is included wherever possible. Unless otherwise indicated, $ stands for US dollars and £ for UK pounds. Any title with an ISBN (International Standard Book Number) should be available through commercial booksellers.

(and should not) be included in a set of environmental accounts; they also show how such figures should be categorized and presented. Both reports conclude with suggestions for further consideration.

BT Corporate Relations, Environmental Issues Unit, Room A245, BT Centre, 81 Newgate Street, London EC1A 7AJ. Tel: + 44 (0171) 356 6696, Fax: + 44 (0171) 356 6915. Pbk, 73p.

The Environment Industry – The Washington Meeting

This publication contains the proceedings of a workshop on the Global Environment Industry, convened by the OECD in collaboration with the US Department of Commerce and the US Environmental Protection Agency. The workshop was designed to improve the analysis of the environment industry sector, to provide comparable data on employment and growth potential, and to break new ground on common definitions and classification.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 285p. ISBN 92-64-14768-3.

Promoting Cleaner Production in Developing Countries – The Role of Development Co-operation

Ensuring cleaner production is now recognized as a crucial way to reconcile environmental and economic goals in the move towards sustainable development. However, many developing countries and their enterprises lack the human, institutional, technical and financial capacities needed to apply cleaner production methods.

Promoting Cleaner Production in Developing Countries provides both donors and recipients with a fresh perspective on the role of development cooperation for cleaner industrial production. It synthesizes actual approaches and experiences of 23 OECD and developing countries, and of a number of multilateral non-governmental organizations.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 99p. ISBN 92-64-14631-8.

Subsidies and Environment – Exploring the Linkages

Sustainable development needs government policies which give appropriate signals about pollution costs and/or natural resource scarcities. Subsidy and tax concession programmes are often suspected of doing exactly the reverse. If this suspicion is warranted, reforming these programmes could produce environmental, economic or fiscal improvements. However, the environmental and economic effects of reforms would depend on the context in which the subsidies were initially granted and on the reforms themselves. Reforms do not necessarily lead to positive changes.

To better understand these issues, OECD Environment Ministers asked the OECD to review subsidies and tax disincentives to sound environmental practice in OECD countries. *Subsidies and Environment – Exploring the Linkages* presents the proceedings and synthesis of a workshop designed to establish the blueprint for the main elements of a future OECD work programme on subsidy-environment linkages.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 218p. ISBN 92-64-14822-1.

Wider Application and Diffusion of Bioremediation Technologies – The Amsterdam '95 Workshop

This publication brings together the contributions of more than 100 international experts and policy makers on the diffusion and industrial application of bioremediation technologies for air and soil.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 456p. ISBN 92-64-14869-8.

Implementation Strategies for Environmental Taxes

Not only can environmental and taxation policies be made compatible, they can also be mutually reinforcing. Integration of policies makes it possible to achieve environmental goals and improve economic efficiency.

Drawing on the experience of OECD countries, *Implementation Strategies for Environmental Taxes* reviews these issues and offers recommendations to fiscal and environmental policy makers and researchers.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 94p. ISBN 92-64-14686-5.

The World Trade Organization and Sustainable Development: An Independent Assessment

The non-profit Canadian International Institute for Sustainable Development has produced an assessment report on the World Trade Organization and its role in advancing sustainable development. A summary version is also available.

IISD, 161 Portage Avenue East, Winnipeg, Manitoba, Canada R3B 0Y4. Tel: + 1 (204) 958 7700, Fax: + 1 (204) 958 7710. Pbk, 65p (report), Pbk, 34p (summary). ISBN 1-895536-03-0.

Environmental Taxes – Implementation and Environmental Effectiveness

This report, from the European Environment Agency, is part of the agency's response to a request from the European Parliament's Committee on Environment, Public Health and Consumer Protection for overview reports on "green taxes" and "voluntary environmental agreements". Aimed at policy-makers and the public, it focuses on the environmental effectiveness of environmental taxes and the political barriers and solutions for their implementation.

European Environment Agency, Kongens Nytorv 6, DK-1050 Kobenhavn K, Denmark. Tel: + 45 (33) 36 71 00, Fax: + 45 (33) 36 71 99. Pbk, 63p. ISBN 92-9167-000-6.

Environmental Funds in Economies in Transition

Most central and eastern European countries and most of the New Independent States of the former Soviet Union face daunting environmental challenges. In a context of severe budgetary constraints, financing environmental expenditures is a key challenge and a common problem in the region. This publication examines the issues involved, focusing on Environmental Funds. These financial institutions redistribute pollution taxes and charges, and have provided an innovative mechanism for financing environmental expenditures. The experience gained is of interest in other regions and contributes to the broader debate on environmental financing.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 126p. ISBN 92-64-14653-9.

Sustainable Transport – Priorities for Policy Reform

Transport is central to development. Without physical access to jobs, health care, education and other amenities, quality of life suffers. Badly designed transport strategies and programmes can, however, result in networks and services that aggravate the condition of the poor, harm the environment, ignore the changing needs of users, and exceed the capacity of public finances.

Sustainable Transport – Priorities for Policy Reform, published by the World Bank, examines the importance of expanding the role of competitive markets, and the involvement of the private sector, in increasing efficiency in the provision and operation of infrastructure and services. It also attempts to set the expanded role of markets explicitly in the broad framework of sustainable development.

World Bank, 1818 H Street, N.W., Washington, D.C. 20433, USA. Tel: +1 (202) 477 1234, Fax: + 1 (202) 477 6391. Pbk, 131p. ISBN 0-8213-3598-7.

State of the Environment Reporting: Source Book of Methods and Approaches

The absence of good and accurate environmental information can impede the decision-making

process. If policy-making and action planning for sustainable development are to be effective, good quality information must be available. State of the Environment (SOE) reporting is one way of developing and communicating environmental information for decision-makers. Over the last 15 years, national governments, international organizations, NGOs and the private sector have produced an enormous number of SOE reports ranging in scope from global to local, in a wide variety of formats. Ideally, local, sectoral, corporate, national, regional and global reports should complement each other (using, for example, common spatial units and databases). In an effort to address this issue, Environment Canada, the Netherlands National Institute of Public Health and Environment (RIVM) and the United Nations Environment Programme (UNEP) have joined forces to develop a tool box to improve environmental reporting. The Source Book is the first result.

The Source Book will help harmonize environmental reporting by encouraging the development of standard methods, practices and terminology. It evaluates and compares alternative approaches for the development, production and dissemination of environmental information and covers all aspects of reporting from user needs to data supply. It will therefore be useful to all those embarking on new reporting initiatives or evaluating and developing existing environmental reporting programmes, as well as in training and capacity building.

UNEP/DEIA/TR.96-1, Division of Environmental Information and Assessment, United Nations Environment Programme, P.O. Box 30552, Nairobi, Kenya. Tel: + 254 (2) 62 1234, Fax: + 254 (2) 62 3944. Pbk, 133p.

Re-Engineering: The Critical Success Factors

This report presents a six-phase method intended to help in the management of re-engineering projects. It focuses on corporate experience of re-engineering, by looking at organizations which have completed the project cycle, and compares their experience with that of organisations which have not. In-depth case studies are included.

Business Intelligence, Forum House, Graham Road, Wimbledon, London SW19 3SW, UK. Tel: + 44 (0181) 543 6565, Fax: + 44 (0181) 544 9020. Pbk, 332p. ISBN 1-898085-18-8.

BIODIVERSITY

Saving Biological Diversity – Economic Incentives

Loss of biodiversity has become an international concern in recent years. It led to the rapid ratification of the Convention on Biological Diversity, one of the three international environmental treaties signed at the 1992 Earth Summit.

Saving Biological Diversity – Economic Incentives examines the status of biodiversity in OECD countries, underlying pressures, and the role of incentive measures in helping guide policy and human action towards conservation and sustainable use.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 155p. ISBN 92-64-14807-8.

EDUCATION AND TRAINING

Training in Environmental Management – Industry and Sustainability
Part 1 – Corporate Environmental and Resource Management and Educational Requirements

This report presents the results of a study identifying the educational requirements of modern, sustainable management practices and compares them with the course programmes offered by the relatively few educational establishments which have begun greening their curricula. The report also outlines possible future educational requirements.

European Foundation for the Improvement of Living and Working Conditions, Loughlinstown, Dublin 18, Ireland. Tel: + 353 (1) 282 6888, Fax: + 353 (1) 282 6456. Pbk, 226p. ISBN 92-827-6927-5.

Environmental Learning for the 21st Century

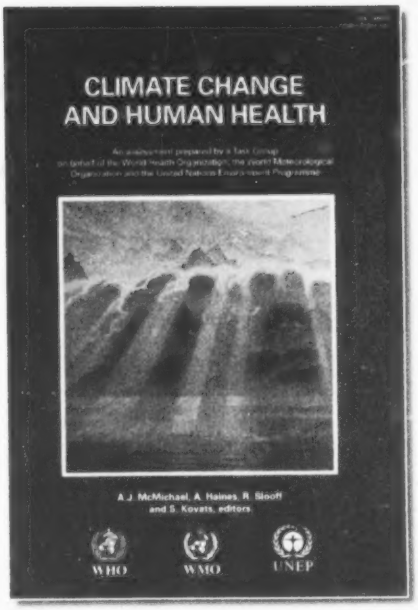
Raising environmental awareness is central to developing a sustainable environment. Appropriate policies and organizational strategies must therefore be developed to support educators. Schools, teachers and students can cooperate creatively in local initiatives with their communities to examine environmental problems through active teaching and learning. *Environmental Learning for the 21st Century* analyses policy approaches, describes school initiatives, and explores methods used in a number of OECD countries.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 110p. ISBN 92-64-14478-1.

CLIMATE CHANGE/ AIR POLLUTION

Climate Change and Human Health

This joint publication from the World Health Organization (WHO), the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) looks at the effects on human health likely to be



caused by the disruption of natural and ecological systems resulting from climate change. The range of health effects would be diverse, often unpredictable in magnitude, and sometimes slow to emerge.

Both "direct" and "indirect" impacts are discussed. Effects such as deaths due to increased frequency of heatwaves, storms and floods are easy to foresee. Others that depend, for example, on changes in patterns of mosquito populations or of regional food production are more difficult to predict. Still other diverse and diffuse public health impacts would result from population displacement and conflict following sea level rise, or from disruptions of local economic activity and employment.

After examining the complex relationship between climate change and human health, techniques for research and monitoring are introduced, and the final chapter presents a series of conclusions and recommendations for future actions.

The main text is supported by concise chapter-by-chapter summaries and a glossary of the scientific terms used.

A.J. McMichael, A. Haines, R. Slooff and S. Kovats, eds. Distribution and Sales, World Health Organization, 1211 Geneva 27, Switzerland. Pbk, 297p.

Technical Responses to Climate Change

This report, produced by the IEA Greenhouse Gas R&D Programme, provides an overview of climate change and a summary of the main technologies available for the abatement of greenhouse gas emissions.

The IEA Greenhouse Gas R&D Programme was established in 1991 to evaluate technologies that can be used to mitigate greenhouse gas emissions from the use of fossil fuels, and to identify targets for useful research and development.

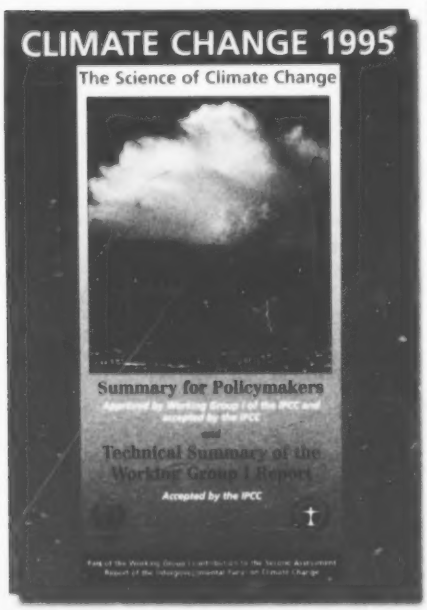
Technical Responses to Climate Change reports on the programme's examination of technologies that can be used to capture, store and utilize carbon dioxide (CO_2), and the more recent examination of methods for reducing emissions of methane (CH_4). The main technical studies concern capture of CO_2 from the flue gases of power plants, storage (in the oceans, aquifers, forests or depleted oil and gas fields) and options for utilization, including in the manufacture of chemicals, enhanced oil recovery and growth of biomass. These techniques complement the more established mitigation options such as improving energy efficiency, fuel switching, nuclear power and renewable energy sources. Through the work of the IEA Greenhouse Gas Programme, the potential for capture and storage of CO_2 can now be properly understood and put into context with other options.

IEA Greenhouse Gas R&D Programme, CRE Group Ltd., Stoke Orchard, Cheltenham, Gloucestershire GL52 4RZ, UK. Tel: + 44 (0) 1242 680753, Fax: + 44 (0) 1242 680758. Pbk, 21p. ISBN 1-898373-18-3.

Climate Change 1995 – Summary for Policymakers and Technical Summary of Working Group I Report

In 1995, the International Panel on Climate Change (IPCC) published its Second Assessment Report (SAR) on climate change. The SAR was compiled from the work of three working groups. The *Summary for Policymakers and Technical Summary* represents part of the Working Group I contribution to the SAR. The summary was approved in detail by IPCC Working Group I. It represents the formally agreed statement of the IPCC on current understanding of the science of climate change. It discusses the physical climate system, the factors that drive climate change, analyses of past climate, detection and attribution of human influence on recent climate change and projections for the future.

UNEP, P.O. Box 30552, Nairobi, Kenya. Tel: + 254 (2) 621234, Fax: + 254 (2) 226886/ 226890. Pbk, 56p.


CLIMATE CHANGE 1995
The Science of Climate Change
Summary for Policymakers
and
Technical Summary of the Working Group I Report
Accepted by the IPCC

Climate Change 1995: Impacts, Adaptations, and Mitigation – Summary for Policymakers – Contribution of Working Group II to the Second Assessment Report

This summary for policymakers is a part of the contribution of Working Group II to the Second Assessment Report from the Intergovernmental Panel on Climate Change. Focusing on potential impacts of climate change, adaptive responses, and measures that could mitigate future emissions of greenhouse gases, it provides an overview of the Working Group's full report.

UNEP, P.O. Box 30552, Nairobi, Kenya. Tel: + 254 (2) 621234, Fax: + 254 (2) 226886/226890. Pbk, 22p.

Ambio – A Journal of the Human Environment Special Issue on Greenhouse Gas Emissions: Mitigation Strategies in Asia and the Pacific

This special issue of *Ambio*, the journal of the Royal Swedish Academy of Sciences, presents papers and articles from specialists on mitigation strategies for greenhouse gas emissions in Asia and the Pacific region

Ambio aims to put significant developments in environmental research, policy and related activities into perspective, and to reach specialists, generalists, decision-makers, students and interested lay people all over the world.

AMBIO, Box 5005, S-1004 05, Stockholm, Sweden. Tel: + 46 (8) 673 95 00, Fax: + 46 (8) 16 62 51. Pbk, 310p. ISSN 0044-7447.

Climate Change in the European Union

Climate Change in the European Union covers the current status, trends and outlook for climate change in the European Union. It gives an overview of the environmental measures implemented to date, as well as analysing the main social trends giving rise to pressure on the environment and climate change and the energy sector.

Kongens Nytorv 6, DK-1050 Kobehavn K, Denmark. Tel: + 45 (33) 36 71 00, Fax: + 45 (33) 36 71 99. Pbk, 25p.

Climate Change, Economic Instruments and Income Distribution

This report focuses on the potential distributive effects of a tax or tradeable permit response to the threat of climate change. The effects are assessed in terms of individual income groups, economic sectors, and countries. The report also suggests broad approaches for mitigating or compensating any adverse effects associated with these instruments.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 67p. ISBN 92-64-14671-7.

Guideline for the Index of the Quality of the Air – Canada

The Index of the Quality of the Air (IQUA) is published for Canadian cities as a single figure derived from the measurement of several air pollutants that are averaged from 1 to 24 hours. It is intended to help relevant agencies better inform the public about the general or prevailing air quality. The index is accepted right across Canada, and many cities and towns are now adopting it.

The guidelines explain the scientific reasoning behind the design of the index and define terms such as maximum desirable objectives, maximum acceptable objectives and maximum tolerable objectives. This is a parallel English and French text.

Environmental Protection Publications, Environment Canada, Ottawa (Ontario) K1A 0H3, Canada. Pbk, 17p. ISBN 0-662-60226-9.

WASTE MANAGEMENT

Management of Urban Biodegradable Wastes

Biological treatment of urban organic wastes is on the increase in Europe. Of the total capacity for biological treatment installed since 1975, around 80 per cent was installed in the period 1991-1995. *Management of Urban Biodegradable Waste* gives comprehensive information on current theory and practice in this developing field.

The source of the information inthis book is material on urban biodegradables from households, trade, light industry, gardens and parks presented to the Biowaste Conference held in Aalborg, Denmark in 1995. Legislation and regulations, methods of composting and collection, management systems, occupational health, anaerobic and other processes, biodegradability, product quality and end-user demands are adressed.

James and James (Science Publishers) Ltd., Waterside House, 47 Kentish Town Road, London NW1 8NZ, UK. Hbk, 343p. ISBN 1-873936-58-3.

Global Waste Survey – Final Report

The Global Waste Survey was initiated in 1991 by the Contracting Parties to the London Convention (1972). Under the terms of the Convention, the signatories agreed to work towards a phase-out of ocean dumping of industrial waste by the end of 1995. The global waste survey was undertaken to assess the implications of such a ban on countries worldwide, especially

developing countries, and to formulate a plan that would assist contracting parties to address their commitment to technical assistance and capacity building in a practical and cost-effective manner.

The Global Waste Survey – Final Report, published by the International Maritime Organization, introduces the survey and describes its background. A second section summarizes the development and contents of the Global Waste Inventory. The inventory gives an overview of the state of waste management in countries, subregions and regions of the world. For developing countries, it can provide an initial framework for categorizing and collating information.

The report also discusses the methodology used to compile National Waste Management Profiles, as well as their contents. These profiles are in-depth examinations of the waste management programmes implemented in contracting-party countries. They can be especially useful to developing countries in three ways: they provide a structure for conducting a review of the strengths and weaknesses of existing national programmes; they present information in a standard format, for use by national decision-makers and for information transfers between countries; and they expand national, regional and international networks, thus increasing national awareness of ongoing programmes and opportunities. The report concludes with examples of 18 pilot national waste profiles.

The International Maritime Organization, 4 Albert Embankment, London SE1 7SR, UK. Pbk, 293p. ISBN 971-9014-01-6.

CHEMICALS, POLLUTION & ACCIDENTS

Guidelines for Drinking-water Quality – Volume 2: Health Criteria and Other Supporting Information

Volume 2 of the *Guidelines for Drinking-water Quality* parallels and extends the coverage of Volume 1, which presented the recommended guideline values and brief summary statements supporting them. Volume 2 reviews and interprets the extensive toxicological, epidemiological and clinical evidence that shaped the guideline values.

This volume has 17 chapters presented in three sections. The first section, on microbiological aspects, addresses the most common and widespread health risks associated with direct or indirect contamination of drinking water with human or animal excreta, particularly faeces. Separate chapters review data on the health hazards posed by selected bacteria, viruses, protozoa, helminths, toxins from cyanobacteria, and nuisance organisms.

The second and most extensive section, which contains almost 800 pages, provides evaluations, supported by toxicological monographs, of each of 36 inorganic constituents and physical parameters, 27 industrial chemicals, 36 pesticides, four disinfectants, and some 23 by-products. Apart from explaining the scientific basis for the guideline values, these monographs provide a rich source of up-to-date, authoritative information on a range of topics.

The final section explains application of the reference level of doses for radiological contaminants in drinking-water and presents the guideline values in a convenient tabular form.

WHO, Distribution and Sales, 1211 Geneva 27, Switzerland. Direct Fax: +41 (22) 791 4857. 973p. ISBN 92-4-154480-5.

IPCS Environmental Health Criteria publications and Health Safety Guides

The International Programme on Chemical Safety (IPCS) is a joint venture between UNEP, the International Labour Organisation and the World Health Organization (WHO). Publications in the Environmental Health Criteria (EHC) series review the environmental and health effects of exposure to a chemical or group of chemicals and provide guidelines for setting exposure limits. The Health and Safety Guide (HSG) series facilitates the application of these guidelines in national chemical safety programmes. The books are in English (those in the EHC series have summaries in French and Spanish), are priced in Swiss francs (shown here) or US dollars, and are available at a discount in developing countries. The series is available from WHO, Distribution and Sales, CH-1211 Geneva 27, Switzerland, and from sales agents for WHO. The most recent titles are:

EHC 177 – 1,2 Dibromoethane (1996). Pbk, 148p. ISBN 92-4-157177-2, SF 23.

EHC 182 – Thallium (1996). Pbk, 274p. ISBN 92-4-157182-9, SF 39.

EHC 185 – Chlorendic Acid and Anhydride (1996). Pbk, 74p. ISBN 92-4-157-185-3, SF 16.

Hazard Assessment and Disaster Mitigation in Petroleum and Chemical Process Industries

This publication contains the proceedings of the technical sessions of the International Workshop on Hazard Assessment and Disaster Mitigation, organized by the Commonwealth Science Council. It also presents status reports and recommendations from the workshop.

The workshop focused its attention mainly on the recent advances and emerging trends in hazard assessment and disaster mitigation in the petroleum and chemical process industries.

Science Publishers, Inc., 10 Water Street, #310, Lebanon, NH 03766, USA. Hbk, 357p. ISBN 81-204-1071-8.

Storage Tanks

A major concern in groundwater contamination has been, and continues to be, leaks of hazardous substances from storage tanks. Tanks, both above and below ground, are used to store all sorts of liquids including gasoline, oil, fuels, process chemicals, hazardous and toxic materials, and wastes. They are therefore an important potential source of contamination and can pose a serious health risk.

This volume on storage tanks, edited by P. Cheremisinoff and published in the Advances in Environmental Control Technology series, provides up-to-date reference material for engineers, technicians, scientists and contractors whose job is to identify and assess technical and regulatory-requirement problems regarding storage tanks.

Gulf Publishing Company, Book Division, P.O. Box 2608, Houston, Texas 77252-2608, USA. Hbk, 303p. ISBN 0-87201-238-7.

Environmental Control in Petroleum Engineering

Environmental Control in Petroleum Engineering provides information to engineers on how to reduce and control the environmental consequences of producing and processing petroleum and natural gas. It examines methods for planning and managing production activities to minimize and even eliminate some environmental problems without severely disrupting operations. There are chapters on ways to treat drilling and production wastes to reduce their toxicity and/or volume before ultimate disposal, and on procedures for safe transport of toxic materials from the upstream petroleum industry.

The book also reviews the remedial technologies available for sites already contaminated with petroleum wastes.

Gulf Publishing Company, European Marketing Office, Trottenstrasse 20, CH-8037 Zurich, Switzerland. Tel: + 41 (1) 271 7653, Fax: + 41 (1) 272 1092. Hbk, 274p. ISBN 0-88415-273-1.

ENVIRONMENTAL LAW

Environmental Rights – Law, Litigation and Access to Justice

The essays in this collection tackle two aspects of the issue of ecological rights, addressing in particular: efforts at the constitutional and institutional level to establish a right to a healthy environment; and the strategies to pursue those rights in the absence of their constitutional recognition in most countries. The essays provide an overview of recent NGO legislation and provide advice on how to instigate actions.

Cameron May, 69-71 Bondway, London SW8 1SQ, UK. Tel: + 44 (0171) 582 7567, Fax: + 44 (0171) 793 8353. Pbk, 343p. ISBN 1-874698 11-2.

Construction, Law and the Environment

This book is intended for lawyers and construction professionals. Its purpose is to provide an outline of the interaction between construction activities and environmental law and a guide to

how environmental regulations and liabilities can be analysed, managed and ensured against.

Cameron May, 69-71 Bondway, London SW8 1SQ, UK. Tel: + 44 (0171) 582 7567, Fax: + 44 (0171) 793 8353. Hbk, 255p. ISBN 1-874698-70-8.

Pollution and Personal Injury – Toxic Torts II

For the purposes of this book, the term "toxic tort" covers any case in which an individual claims to have suffered damage to person, property or the quiet enjoyment of his/her property as a result of environmental pollution. It provides background material and help for legal practitioners involved in such cases.

Cameron May, 69-71 Bondway, London SW8 1SQ, UK. Tel: + 44 (0171) 582 7567, Fax: + 44 (0171) 793 8353. Hbk, 297p. ISBN 1-874698-16-3.

Integrated Pollution Control

This book describes the legislative and administrative aspects of integrated pollution control in England and Wales.

Cameron May, 69-71 Bondway, London SW8 1SQ, UK. Tel: + 44 (0171) 582 7567, Fax: + 44 (0171) 793 8353. Hbk, 309p. ISBN 1-874698-50-5.

Greening International Institutions

Greening International Institutions is the latest in a series of publications devoted to environmental and development law. The book assesses how far and how successfully intergovernmental organizations have responded to the challenge of making development sustainable.

The organizations analysed include the UN General Assembly, the Commission for Sustainable Development, UNEP, UNDP and UNCTAD, WTO, GATT, NAFTA, the Bretton Woods institutions, and several regional bodies. For each of these, the book provides an overview of the organization's mandate and structure, examines policy initiatives, and assesses the need and scope for procedural and institutional reform.

Earthscan Publications Limited, 120 Pentonville Road, London N1 9JN, UK. Tel: + 44 (0171) 278 0433, Fax: + 44 (0171) 278 1142. Pbk, 334p. ISBN 1-85383-244-8.

NATIONAL/REGIONAL

State of Environment and Development in Indian Coalfields

Mining activities are carried out in backward regions of India where they are known to cause widespread land loss, land degradation, and depletion of groundwater, and to have other serious environmental impacts. Mining affects local resources and pervades the overall socio-economic life of the regions where it is practised, endangering lives and property. No publication to date has given a comprehensive picture of the environmental damage and associated lack of sustainable development caused by such activities. *State of Environment and Development in Indian Coalfields*, by Dr Sunit Kumar and Subkhanar Sarker, fills this gap by presenting a vivid picture of the environmental effects of coal mining in the coalbelts of the state of West Bengal.

Their book not only covers the technical aspects of environmental impacts – in 11 chapters covering subjects ranging from land degradation to air pollution – but also shows how mining activities are interwoven into the fabric of rural society. Dr Kumar is originally an inhabitant of the coalfield area. His interactions with many of its citizens allows their hopes, fears and aspirations to form the background against which more technical aspects are explored.

Oxford and IBH Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi 110 001, India. Hbk, 185p. ISBN 81-204-1061-0.

Forum on the Caspian, Aral and Dead Seas and The Symposium of the Aral Sea and the Surrounding Area – Proceedings

With the reconfiguration of the former Soviet Union, the two largest salt lakes in the world, the Caspian and Aral Seas became water resources to be shared by nine different countries. It has become clear that the environmental quality of the two lakes is severely degraded. The countries which share this burden must find solutions in a multi-party arena.

Acknowledging the necessity for a multi-party framework, the United Nations University organized a forum on the Caspian, Aral and Dead Seas. It was held on 27 March 1995 and attended by scholars from the Eurasian region and elsewhere. The papers presented, now available in the form of a report, are diverse in nature, technical emphasis, focus and methodology. Taken together, they constitute a specialized body of knowledge that will contribute to the sharing of scientific concepts and test results.

United Nations Environment Programme, International Environmental Technology Centre, Osaka Office, 2-110 Ryokuchi koen, Tsurumi-ku, Osaka 538, Japan. Tel: + 81 (6) 915 4580, Fax: + 81 (6) 915 0304. Pbk, 145p. ISBN 92-807-1506-2.

Environmental Performance Reviews – Estonia

This is the first environmental performance review carried out under the auspices of the Committee on Environmental Policy of the Economic Commission for Europe (ECE). It was carried out by a team of experts from five countries (the Czech Republic, Finland, France, Germany and Ukraine) and members of the ECE Secretariat and its consultants.

The review focuses on capacity building, air, water and waste, and on the integration of environmental and economic policies, both generally and in the energy sector specifically. The current situation and likely future trends are analysed. The principal conclusions and recommendations for improving Estonia's environmental performance are brought together in the final chapter.

United Nations Economic Commission for Europe, Palais des Nations, CH-1211 Geneva, Switzerland. Tel: + 41 (22) 917 3241, Fax: + 41 (22) 917 0123. Pbk, 102p. ISBN 1020-4563.

Sustainable America – A New Consensus

This report is from the President's Council on Sustainable Development, established by President Clinton in 1993. It identifies 154 specific actions required to apply 38 recommendations on a range of issues, including economic and regulatory policy, management of natural resources, education, and international policy.

US Government Printing Office, Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328, USA. Pbk, 186p. ISBN 0-16-048529-0.

Selected Environmental Standards of the People's Republic of China (1973-1995)

This book contains 13 national environmental quality standards and 60 national discharge standards for pollution issued by the Chinese government. It is the first time Chinese national environmental standards have been made available in English.

Foreign Economic Cooperation Office, China National Environmental Protection Agency, No. 115, Xizhimennei, Nanxiaojie, Beijing, 100035, People's Republic of China. Tel: + 86 (10) 66151792, Fax: + 86 (10) 66151776. Pbk, 292p.

Promoting Cleaner and Safer Industrial Production in Central and Eastern Europe

This volume brings together papers presented at a seminar on "Auditing to Improve Safety, Environmental Performance and Economic Efficiency", in which the Ukrainian chemical industry was a particular focus of discussion. The

papers describe practical experiences, showing how environmental and economic performance can be enhanced at little or no cost.

OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16. Tel: + 33 (1) 45 24 82 00, Fax: + 33 (1) 49 10 42 76. Pbk, 144p. ISBN 92-64-14589-3

Competing in the New Environmental Marketplace

In 1995, the Regional Environmental Centre (REC) hosted workshops for environmental professionals in Poland, the Czech Republic, the Slovak Republic and Hungary. Their purpose was to provide professionals with an overview of the emerging environmental market and to encourage dialogue between business representatives and government regulators.

The proceedings of these workshops have now been published in a report, *Competing in the New Environmental Marketplace*. A summary of each workshop is given, and those presentations originally made in English are included.

The Regional Environmental Centre, Miklos ter 1, 1035 Budapest, Hungary. Tel: + 36 (1) 250 3401, Fax: + 36 (1) 250 3403. Pbk, 95p. ISBN 963-8454-33-4.

DIRECTORIES

Government and Environment – A Directory of Governmental Organizations with Environmental Responsibilities in Central and Eastern Europe

In their efforts to address environmental issues more efficiently, Central and Eastern European Governments have reorganized at several different levels. Some environmental responsibilities have been transferred to the regional or local level or are now shared between several national and regional agencies. In many cases government departments outside of the Ministry of Environment have acquired influence over environmental issues.

This restructuring has made it difficult to identify the governmental body or organization responsible for particular environmental issues and to track down important information, accurate data or a well-informed expert. This directory has been compiled to clarify the structure of the relevant government institutions and to facilitate searches for information.

The directory identifies all of the ministries and governmental organizations with significant environmental responsibilities in 13 central and eastern European countries. The country chapters are divided into four sections: administrative bodies, environmental monitoring, public access to environmental information, and enforcement and control. Each section provides key contacts, statistics, history, environmental responsibilities, publications, and/or organizational structure.

The Regional Environmental Center, Miklos ter 1, 1035 Budapest, Hungary. Tel: + 36 (1) 250 3401, Fax: + 36 (1) 250 3403. Pbk, 145p. ISBN 963-8454-24-5.

Environmental Markets Asia: 1996-1997

Released in August 1996, *Environmental Markets Asia: 1996-1997* contains 140 pages of strategic information on the latest environmental regulatory and market developments in 16 Asia-Pacific countries and territories. The following are covered: Brunei, Cambodia, China, Hong Kong, India, Indonesia, Laos, Malaysia, Myanmar, Pakistan, Philippines, Singapore, South Korea, Taiwan, Thailand, and Vietnam.

Environmental Information Unit, SGS (Thailand) Ltd., 100 Nanglinchee Chongnonsee, Yannawa, Bangkok 10120, Thailand. Fax: + 66 (2) 678 0622 or + 66 (2) 678 1508. Pbk, 137p. ISSN 0859-0923.

EDITIONS FRANCAISES

Technologies propres et sobres

Conçu par un ingénieur spécialisé depuis trente ans dans les questions d'environnement, cet ouvrage part du principe selon lequel le déchet le plus simple à éliminer est celui que l'on ne produit pas. Il fait le point sur les moyens de production moins polluants, et définit à l'aide d'exemples concrets et significatifs la nouvelle stratégie des entreprises qui se trouvent confrontées à de nombreuses contraintes environnementales et à des impératifs absolus de rentabilité.

Cet ouvrage concerne aussi bien les industriels qui ont un rôle majeur à jouer dans la promotion et l'usage des technologies propres et sobres, que les professionnels du déchet qui sont confrontés à des enjeux considérables, ou les collectivités locales qui doivent promouvoir et encourager l'utilisation des technologies les moins polluantes et les plus économiques en énergie.

Michel Maes (1996). Pierre Johanet & Fils Editeurs SA, 30 rue René Boulanger, 75010 Paris, France. Tél: + 33 (1) 42.40.00.08, Fax: + 33 (1) 42.40.26.46. Poche, 346p.

Programme d'action national de l'environnement et du développement durable pour le XXIeme siècle – Tunisie

Le Programme d'action national de l'environnement et du développement durable pour le XXIème siècle présente la version tunisienne des enjeux et des défis du développement durable tels que posés à la Tunisie d'aujourd'hui et leurs projections. Il identifie les actions et mesures les plus adéquates pour garantir au pays un développement en harmonie avec l'environnement pour le bien des générations actuelles et futures.

Ministère de l'Environnement et de l'Aménagement du Territoire, Centre Urbain Nord – Immeuble I.C.F., 2080 Ariana, Tunis, Tunisie. Tél: + 216 (1) 704 000. Poche 244p. ISBN 9973-940-01-6.

La conférence ministérielle de Tunis sur le développement durable en Méditerranée – Agenda MED 21

Des modes de développement erronés se traduisent par une économie mal maîtrisée au nord de la Méditerranée et par une surexploitation des ressources naturelles au sud. Ils génèrent des problèmes environnementaux dramatiques. L'Agenda 21 sur lequel plus de 150 Etats se sont engagés à Rio traduit un consensus mondial et un engagement politique pour intégrer les questions d'environnement et de développement et faire du développement durable une réalité pour le 21 ème siècle. Cependant, l'Agenda 21 a une portée universelle et ne s'attache pas aux spécificités méditerranéennes. *MED 21* vise à créer un cadre de réflexion pour l'identification d'objectifs à atteindre dans la région méditerranéenne dans l'optique de l'Agenda 21. Il y aura lieu, éventuellement, d'introduire certains chapitres particuliers tels que : le tourisme, le transport maritime, le patrimoine culturel, l'énergie, la pêche et l'aquaculture. Le cadre de réflexion proposé par *MED 21* respecte l'architecture de l'Agenda 21. *MED 21* est une étape intermédiaire commode et nullement un produit définitif. Le document existe également en version anglaise.

Ministère de l'Environnement et de l'Aménagement du Territoire, Centre Urbain Nord – Immeuble I.C.F., 2080 Ariana, Tunis, Tunisie. Tél: + 216 (1) 704 000. Poche 157p.

Tunisie – Rapports nationaux sur l'état de l'environnement, 1993, 1994 et 1995

L'élaboration d'un rapport national sur l'état de l'environnement est devenu depuis 1993 une priorité et une tradition au sein du Ministère de l'Environnement et de l'Aménagement du Territoire tunisien.

Le premier rapport, celui de 1993, fait le bilan de l'état de l'environnement en Tunisie après une période de croissance économique rapide. La politique de développement est passée en revue afin de l' harmoniser avec la protection de l'environnement et ses implications écologiques.

Le rapport de 1994 insiste sur trois domaines fondamentaux pour le développement durable de la Tunisie : la lutte contre la désertification ; la préservation des ressources en eau ; et l'énergie et l'environnement.

Le troisième rapport, de 1995, s'inscrit dans la lignée des deux précédents. Il examine les changements dans les domaines suivants : le domaine institutionnel et juridique relatif à l'environnement ; le développement durable ; l'eau ; l'assainissement ; les déchets urbains ; le littoral ; la pêche ; la désertification ; la sensibilisation et l'éducation environnementale.

Ministère de l'Environnement et de l'Aménage-

ment du Territoire, Centre Urbain Nord – Immeuble I.C.F., 2080 Ariana, Tunis, Tunisie. Tél : + 216 (1) 704 000. Poche 138p – 1993, 125p – 1994, 103p – 1995.

Les fascicules du Plan Bleu – Transports et environnement en Méditerranée

Le fascicule *Transports et environnement en Méditerranée* est publié sous l'égide du Programme des Nations Unies pour l'environnement dans le cadre du Plan d'Action pour la Méditerranée. Ce plan comporte plusieurs éléments et notamment un travail d'observation, d'analyse systématique et de prospective sur l'évolution des rapports entre population, ressources, environnement et développement dans l'ensemble du bassin méditerranéen, appelé Plan Bleu. *Transports et environnement en Méditerranée* porte sur un secteur particulièrement important puisqu'il intègre le niveau d'activité des autres grands secteurs économiques (agriculture, industrie, énergie et tourisme) et qu'il combine des modes terrestres, maritimes, et aériens dans un espace particulièrement fragile. L'intensité du trafic maritime d'hydrocarbures ne passant pour la plupart qu'en transit dans une mer fermée et sans marées, l'accroissement spectaculaire à prévoir du trafic d'automobiles et de camions sur un littoral convoité, qui est le siège de mouvements touristiques considérables mais indispensables à l'économie, soulèvent des questions difficiles. Ce fascicule analyse les évolutions récentes et les avenirs possibles des transports dans l'ensemble du bassin méditerranéen.

Economica, 49 rue Héricart, 75015, Paris, France. Tél : + 33 (1) 45 79 93 56. Fax : + 33 (1) 45 75 05 67. Poche 250p. ISBN 2-7178-31134-4.

Débat public et infrastructures de transport – Rapport au Ministre de l'Environnement

La transparence dans l'action publique répond au souci des citoyens de comprendre et de s'informer, mais aussi de ne plus être des administrés qui subissent pour devenir des citoyens qui participent. Cependant, en France la pratique de la participation n'est, aujourd'hui encore, ni habituelle, ni facile.

En ce qui concerne les grandes infrastructures de transport, depuis 1976 de nombreux textes ont fourni les éléments d'une consultation publique. Un décret du 10 mai 1996 a installé une Commission Nationale de Débat Public conçue pour piloter un large débat touchant l'ensemble de chaque axe projeté dès sa conception. Le Ministre de l'Environnement Français a donc demandé à la Cellule de prospective et stratégie, du Ministère de l'Environnement, de proposer des éléments de réflexion pour définir une politique globale. Le rapport *Débat public et infrastructures de transport* analyse ce sujet à froid et hors du champ des opérations en cours.

Ministère de l'environnement, Cellule de prospective et stratégie, 20 Avenue de Ségur, 75302 Paris, France Tél : + 33 (1) 42 19 20 21. Poche 90p.

Transport privé et public : mobilité, communication et enjeux urbains

Ce document couvre tous les modes de déplacement, individuels et collectifs : la marche, les deux-roues, le transport collectif et la voiture particulière.

La première partie du rapport présente une vision systématique des relations entre d'une part le transport, les communications et l'utilisation du sol, et d'autre part l'environnement.

La deuxième partie est consacrée à des étude de cas, principalement des villes et des entreprises. En dernier lieu, le document présente une méthodologie des projets et de l'action.

4D Dossiers et Débats pour le Développement Durable, 7 Impasse Charles Petit, F-75011, Paris, France. Tél : + 33 (1) 44 64 74 94. Fax : + 33 (1) 44 64 72 76. Poche 108p. ◆

Thank you – from Argentina

The Argentinian Fundacion Ambiente y Recursos Naturales (FARN) set up an Information Centre, in 1991, to provide information to private and public sector decision makers dealing with environmental law, policy, economics and institutional information. The FARN recently asked UNEP IE for documentary support for its new Regional Training Centre for Public Policy, Law and Institutional Organization for Sustainable Development. UNEP IE responded by providing some 30 publications to the FARN. We have received the following letter from its Executive Director:

Thank you very much for the information you have supplied to our Information Centre. The information has proved to be extremely valuable and is consulted regularly by policy makers, parliamentarians, public-sector managers, corporate managers, NGOs, independent professionals, consultants and academics. It is also used, on an occasional basis, by researchers, trainers and organizers of outreach activities. Your support and the benefit of your experience are of great value for our work. Thank you once again.

Pedro Tarak
Executive Director
FARN
Monroe 2142 (1428)
Buenos Aires
Argentina

and from Zimbabwe

On behalf of the University Library, I would like to thank you for the gift of the publication Environmental Management in the Brewing Industry.

The resources of the library are available to the students and staff of the University and research workers throughout Zimbabwe. Your generous gift will assist us in maintaining this service.

S.M. Made
University Librarian
University of Zimbabwe
P.O. Box MP 45
Mount Pleasant
Harare, Zimbabwe

THE ROLE OF UNEP INDUSTRY AND ENVIRONMENT

It is now widely accepted that sustainable development and a sound environment go hand-in-hand. UNEP recognized this as early as 1975 when it established the Industry and Environment centre (IE), located in Paris. UNEP IE functions as a catalyst to bring industry, government and non-governmental organizations together to work towards environmentally sound forms of industrial development. UNEP IE seeks to:

- define and encourage the incorporation of environmental criteria in industrial development;
- help formulate policies and strategies for sustainable industrial development and facilitate their implementation;
- promote preventive environmental protection through cleaner production and other pro-active approaches; and
- stimulate the exchange of information on environmentally sound forms of industrial development.

To achieve these goals, UNEP IE has developed programmes in the fields of Awareness and Preparedness for Emergencies at Local Level (APELL), Cleaner Production, Tourism and Transport, and other sector-specific activities. The Ozon-Action Programme, under the Multilateral Fund, is also based at UNEP IE. UNEP IE organizes conferences and seminars, undertakes training activities and demonstration projects, and produces practical supporting publications.

To promote the transfer of information and experience, UNEP IE has developed:

- The *Industry and Environment* quarterly review;
- A *Query-Response Service*, which responds to specific technical queries on a wide range of subjects related to industrial pollution;
- *Outreach Activities*, which address a broad range of issues concerning industry as a whole. UNEP IE develops partnerships with industry, government and non-governmental organizations, organizes consultative meetings, and publishes supporting documents aimed at spreading new developments in the field of sustainable development.
- A *Technical Report Series* and other publications, which provide practical information to readers throughout the world. Recent titles include *Cleaner Production Worldwide, Hazards Identification in the Local Community, From Regulations to Industry Compliance: Building Institutional Capabilities, Audit and Reduction Manual for Industrial Emissions and Wastes, Companies Organization and Public Communication on Environmental Issues*, and many others. For a complete list of available publications, please contact UNEP IE.

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FEEDBACK

If you would like to respond to something you've read in these pages — to agree or to take issue with a point of view, to clarify a point of fact, or to provide information on a particular aspect — write to us. If you would like to air your views on any other subject relevant to ***Industry and Environment***, we would like to hear from you. As space is limited, we cannot guarantee to publish all letters, nor to publish long ones in full.

Send your Feedback letters to:

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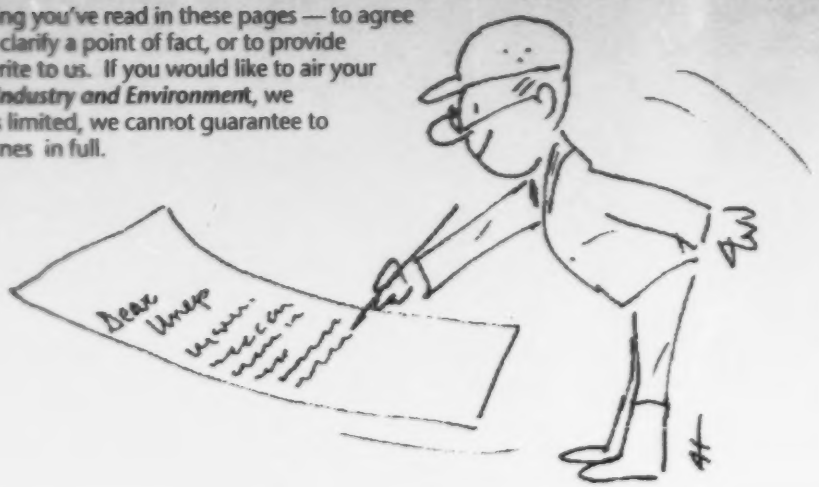

Industry and Environment Review

a publication of the United Nations Environment Programme
Industry and Environment – UNEP IE

For more than fifteen years, the ***Industry and Environment*** quarterly review has provided a forum for the exchange of research and experience, presenting articles written by and for industry managers, government officials and researchers in the field of sustainable industrial development. In addition to features, news and developments of broad international interest, each issue of the review focuses on a particular theme. Recent issues have covered such varied topics as climate change and industry, education and training, managing contaminated land, transport, and sustainable tourism development. For a complete list of past issues and their availability, contact UNEP IE.

The next issue of ***Industry and Environment*** will focus on the theme of environmental management of industrial parks.

While ***Industry and Environment*** is an English language publication, it also includes articles in French and Spanish. All contributed articles are accompanied by summaries in English, French and Spanish.

环境署

The review is now also available in Chinese translation. For further details, please contact: Professor Chen Dingmao, Research Center for Eco-Environmental Sciences, Academia Sinica, P.O. Box 2871, Beijing 100085, China.

***INDUSTRY AND ENVIRONMENT* SUPPLEMENTS**

The ***Industry and Environment*** review includes three semi-annual supplements, the *APELL*, *Cleaner Production* and *EnTA* newsletters.

UNEP IE's APELL programme – Awareness and Preparedness for Emergencies at Local Level – seeks to minimize the occurrence and impact of industrial accidents. This newsletter keeps readers up-to-date on APELL programmes currently in progress around the world.

Cleaner Production

The Cleaner Production newsletter provides information on cleaner technologies and products, actions by governments and organizations to promote cleaner production, and the UNEP IE Cleaner Production activities and network.

EnTA

The EnTA newsletter reports on technology assessment as a tool to develop environmentally sound technologies and to discourage the export of those that pose potential environmental hazards.

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